05-71 DEPARTMENT OF EDUCATION

Chapter 132 – Learning Results: Parameters for Essential Instruction

SUMMARY: The Maine Department of Education Regulation 132 - The Maine *Learning Results: Parameters for Essential Instruction* establishes parameters for essential teaching and learning in grades Pre-Kindergarten through Diploma across eight content areas and supports the goals outlined in the Guiding Principles. The Maine *Learning Results: Parameters for Essential Instruction* will inform the blueprint for item development of the large-scale State assessments aligned to the federal accountability standards found in Maine Department of Education Regulation 131 – The Federal, State, and Local Accountability Standards. High school, middle school, and elementary school programming in Maine's publicly supported schools must be aligned to the knowledge and skills described in the Maine *Learning Results: Parameters for Essential Instruction*.

The Maine Department of Education Regulation 132 - The Maine *Learning Results: Parameters for Essential Instruction* augments and expands upon the content standards for federal accountability (Maine Department of Education Regulation 131: The Maine Federal, State, and Local Accountability Standards) by describing details for essential teaching and learning for eight content areas. These learning goals identify the knowledge and skills required for college, career and citizenship in the 21st century.

THE GUIDING PRINCIPLES – The knowledge and skills described in the Maine Department of Education Regulation 132 support Maine students in achieving the goals established in Maine's Guiding Principles. The Guiding Principles state that each Maine student must leave school as:

A. A clear and effective communicator who:
   1. Demonstrates organized and purposeful communication in English and at least one other language;
   2. Uses evidence and logic appropriately in communication
   3. Adjusts communication based on the audience; and
   4. Uses a variety of modes of expression (spoken, written, and visual and performing including the use of technology to create and share the expressions);

B. A self-directed and lifelong learner who:
   1. Recognizes the need for information and locates and evaluates resources;
   2. Applies knowledge to set goals and make informed decisions;
   3. Applies knowledge in new contexts;
   4. Demonstrates initiative and independence;
   5. Demonstrates flexibility including the ability to learn, unlearn, and relearn;
   6. Demonstrates reliability and concern for quality; and
   7. Uses interpersonal skills to learn and work with individuals from diverse backgrounds;

C. A creative and practical problem solver who: [1995, c. 649, §1 (new).]
   1. Observes and evaluates situations to define problems;
   2. Frames questions, makes predictions, and designs data/information collection and analysis strategies;
   3. Identifies patterns, trends, and relationships that apply to solutions;
   4. Generates a variety of solutions, builds a case for a best response and critically evaluates the effectiveness of the response;
   5. Sees opportunities, finds resources, and seeks results;
   6. Uses information and technology to solve problems; and
   7. Perseveres in challenging situations;

D. A responsible and involved citizen who:

1. Participates positively in the community and designs creative solutions to meet human needs and wants;
2. Accepts responsibility for personal decisions and actions;
3. Demonstrates ethical behavior and the moral courage to sustain it;
4. Understands and respects diversity;
5. Displays global awareness and economic and civic literacy; and
6. Demonstrates awareness of personal and community health and wellness;

E. An integrative and informed thinker who:

1. Gains and applies knowledge across disciplines and learning contexts and to real life situations with and without technology;
2. Evaluates and synthesizes information from multiple sources;
3. Applies ideas across disciplines; and
4. Applies systems thinking to understand the interaction and influence of related parts on each other and on outcomes.

CAREER AND EDUCATION DEVELOPMENT

Career and education development helps all students gain the knowledge, skills, and behaviors to interact with others, set goals, and make decisions related to career, college, and citizenship. Success in the twenty-first century differs significantly from the twentieth century model. Lifelong employment with a single employer has virtually vanished. Success today is increasingly dependent on a sophisticated knowledge base, the ability to enhance that base, to collaborate, to self-direct, and to adapt to change. Individuals will need to adapt their goals and decisions over their lifetimes in relation to school and workplace requirements and personal responsibilities. As part of career and education development, students must see education as a continuous lifelong process that will prepare them for and make them adaptable in a complex, information-rich, and fast-changing world.

Embed Career and Education Development Instruction - The knowledge, skills, and behaviors outlined in Career and Education Development Standards are essential for all students. It is important that the knowledge, skills, and behaviors of career and education development be connected to the context of schools, career, and community. Although stand- alone courses in career and education development may serve to help students focus on career, college, and citizenship goal, all content areas need to embed career and educations standards to enable students to make the connection between content areas schoolwork, and career, college, and citizenship goals. School administrative units should determine the most appropriate content areas and school settings in which to embed these standards.

OUTLINE OF CAREER AND EDUCATION DEVELOPMENT STANDARDS AND PERFORMANCE INDICATOR LABELS

A. Learning about Self-Knowledge and Interpersonal Relationships
1. Self-Knowledge and Self-Concept
2. Beliefs and Behaviors that Lead to Success
3. Interpersonal Skills
4. Career and Life Roles
B. Learning About and Exploring Education, Career, and Life Roles
1. Relationships among Learning, Work, the Community, and the Global Economy
2. Skills for Individual/Personal Success in the 21st Century
3. Education and Career Information
C. Learning to Make Decisions, Plan and Create Opportunities, and Make Meaningful Contributions
1. The Planning Process
2. Decision-Making
3. Influences on Decision-Making
4. Societal Needs and Changes that Influence Workplace Success

A. <u>Learning About Self-Knowledge and Interpersonal Relationships</u>: Students identify, demonstrate, analyze, and evaluate:

- **self-knowledge related to interests, skills, work, and school;**
- **positive personal traits, attitudes, beliefs, behaviors, *habits of mind*, and experiences that lead to success in school, work, and community;**
- **their ability to build and maintain a positive *self-concept*; and**
- **their ability to develop and recognize the positive *interpersonal skills* that effectively influence work and relationships with others.**

Although the performance indicators of Career and Education Development identify specific levels of performance at each grade span for the purpose of assessment, students at all grade spans should have opportunities to identify, demonstrate, analyze, and evaluate.

A1 Self-Knowledge and Self-Concept

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify interests, skills, and *habits of mind* that build a positive *self-concept*.	**Students identify and demonstrate interests, skills, *habits of mind*, and experiences that build and maintain a positive *self-concept.***	**Students explain how interests, skills, *habits of mind*, and experiences support and maintain a positive *self-concept*.**	**Students reflect on and/or analyze interests, skills, *habits of mind*, and experiences to maintain a positive *self-concept* and to aid them in making career and life decisions.** a. *School-to-school* decisions. b. *School-to-work* decisions.

A2 Beliefs and Behaviors that Lead to Success

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify and demonstrate the skills, behaviors, and attitudes that lead to success in schoolwork.	**Students make choices about and demonstrate behaviors that lead to success in schoolwork.**	**Students analyze how positive and negative personal traits, choices about behaviors, and the belief that one can successfully complete tasks/goals affect success in school.**	**Students demonstrate and evaluate strategies to improve their personal traits, behaviors, and the belief that one can successfully complete tasks/goals required for success in career and school.** a. *School-to-school* decisions b. *School-to-work* decisions

A3 Interpersonal Skills

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify social skills that influence interpersonal relationships in positive ways. a. Getting along with others b. Respecting differences c. Working as a member of a team d. Managing conflict e. Accepting/giving/using constructive feedback f. Accepting responsibility for personal behavior g. Demonstrating ethical behavior h. Following established rules/etiquette for observing/listening i. Demonstrating safe behavior	**Students identify decisions and demonstrate behaviors that reflect positive *interpersonal skills* and lead to success in school or community.** a. Getting along with others b. Respecting diversity c. Working as a member of a team d. Managing conflict e. Accepting/giving/using constructive feedback f. Accepting responsibility for personal behavior g. Demonstrating ethical behavior h. Following established rules/etiquette for observing/listening i. Demonstrating safe behavior j. Dealing with peer pressure	**Students demonstrate behaviors that reflect positive *interpersonal skills* and analyze how positive *interpersonal skills* lead to success in a variety of school, work, and community settings.** a. Getting along with others b. Respecting diversity c. Working as a member of a team d. Managing conflict e. Accepting/giving/using constructive feedback f. Accepting responsibility for personal behavior g. Demonstrating ethical behavior h. Following established rules/etiquette for observing/listening i. Demonstrating safe behavior j. Dealing with peer pressure	**Students demonstrate behaviors that reflect positive *interpersonal skills* and evaluate successful strategies that improve positive *interpersonal skills* in ways that lead to success in a variety of school, work, and community settings.** a. Getting along with others b. Respecting diversity c. Working as a member of a team d. Managing conflict e. Accepting/giving/using constructive feedback f. Accepting responsibility for personal behavior g. Demonstrating ethical behavior h. Following established rules/etiquette for observing/listening i. Demonstrating safe behavior j. Dealing with peer pressure

A4 Career and Life Roles

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify and discuss *career roles*.	**Students identify and explain the influences that *career and life roles* have on each other and on success in school or community.**	**Students develop and demonstrate positive strategies that aid in accomplishing tasks, creating *balance* among their *career and life roles,* and reducing stress.** a. Time management b. Goal-setting c. Resource management	**Students demonstrate and evaluate successful strategies for accomplishing tasks, *balancing career and life roles*, and reducing stress in a variety of school, work, and community settings.** a. Time management b. Goal-setting c. Resource management

B. Learning about and Exploring Education and *Career and Life Roles*: Students identify, demonstrate, analyze, and evaluate:

- **An understanding of the relationship between education and work, especially how learning new skills and educational achievement lead to increased work options and success with personal career and life goals; and**
- **the ability to identify and use education and career information for lifelong learning to achieve success.**

Although the performance indicators of Career and Education Development identify specific levels of performance at each grade span for the purpose of assessment, students at all grade spans should have opportunities to identify, demonstrate, analyze and evaluate.

B1 Relationships Among Learning, Work, the Community, and the Global Economy

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify and demonstrate study habits, attitudes, and behaviors that lead to successful relationships.	**Students explain how success in school supports their ability to positively contribute to school, home, and community.**	**Students explain how educational achievement and lifelong learning lead to increased participation in school, work, community, and the world.**	**Students evaluate strategies for improving educational achievement, increasing participation as an involved citizen, and increasing work options and earning potential in a 21st century global economy.**

B2 Skills for Individual/Personal Success in the 21st Century

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify *literacy* and *numeracy* as skills that lead to improvement and success in the classroom.	**Students identify and describe skills that lead to student learning and success in the classroom, and the achievement of schoolwork, career, and personal life goals.** a. Literacy skills b. *Numeracy* c. *Critical thinking* skills d. *Information and communication technology (ICT) literacy* e. *Interpersonal skills* f. Other academic skills and knowledge	**Students analyze their skills in relation to those that lead to learning and success in the classroom, and the achievement of schoolwork, career, and personal life goals.** a. Literacy skills b. *Numeracy* c. *Critical thinking* skills d. *Information and communication technology (ICT) literacy* e. *Interpersonal skills* f. Other academic skills and knowledge	**Students evaluate strategies to improve skills that lead to lifelong learning and success in the classroom, and the achievement of schoolwork, work and career, and personal life goals.** a. Literacy skills *b.* *Numeracy* c. *Critical thinking* skills d. *Information and communication technology (ICT) literacy* *e.* *Interpersonal skills* f. Other academic skills and knowledge

B3 Education and Career Information

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify and locate information resources at home, at school, and in the community that improve study habits, schoolwork, or educational achievement.	**Students identify and locate different types of career and educational information resources and use them to explore school and career choices.**	**Students locate and analyze the use of different types of resources, including *occupational information* and *labor market information*, to explore *post-secondary education, training*, and career choices.**	**Students use previously acquired knowledge and skills to evaluate and utilize a variety of resources to articulate a plan and make decisions for *post-secondary education, training*, and career choices.**

C. Learning To Make Decisions, Plan and Create Opportunities, and Make Meaningful Contributions: Students identify, demonstrate, analyze, and evaluate:

- **the main components of the *planning process*;**
- **their ability to balance career, college, and citizenship roles;**
- **their ability to apply successful strategies for effective decision-making; and**
- **their ability to analyze the influence of diverse and changing societal and global economic needs on personal decision-making and career and education planning/success.**

Although the performance indicators of Career and Education Development identify specific levels of performance at each grade span for the purpose of assessment, students at all grade spans should have opportunities to identify, demonstrate, analyze and evaluate.

C1 The Planning Process

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify and give examples of how they make choices and set personal goals for school.	**Students identify the parts of the *planning process* that assist in making choices.** a. Self-knowledge b. Information and resources about career and educational options c. Decision-making skills	**Students explain how the parts of the *planning process* assist in the exploration of education and work opportunities, and serve as tools for setting short-term and long-term goals.** a. Self-knowledge b. Looking for and creating personal career options c. Decision-making skills	**Students use the *planning process* to make *school-to-school* and *school-to-work* decisions.** a. Self-knowledge b. Looking for and creating personal career options c. Decision-making skills

C2 Decision- Making

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify experiences and behaviors that reflect decision-making at school.	**Students identify behaviors and decisions that reflect positive and negative consequences in school.**	**Students compare and apply different models for decision-making including the *rational, intuitive, and consultative models* for setting short-term and long-term goals in career and education.**	**Students determine and apply effective decision-making strategies for accomplishing short-term and long-term goals related to *school-to-school* and *school-to-work* decisions.**

C3 Influences on Decision-Making

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify people and experiences that influence decision- making in various settings.	**Students identify behaviors that influence decision- making in various settings.**	**Students identify behaviors that influence career and education decision- making.**	**Students examine sources of information that influence their career and education decision-making.**

C4 Societal Needs and Changes that Influence Workplace Success

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
No performance indicator.	**No performance indicator.**	**Students identify and explain how diverse and changing societal and global needs, including economic needs, influence personal decision-making.**	**Students analyze and evaluate strategies for addressing diverse and changing societal and global economic needs that influence personal decision- making for workplace success.**

ENGLISH LANGUAGE ARTS

~~The English language arts form the foundation for effective communication. The ability to construct meaning through reading, writing, listening, speaking, viewing, and the process of inquiring as well as the ability to present ideas through writing, speaking, and visual media are the bases of English language arts. These skills, essential to the health of our democracy and the quality of our culture, have become ever more important with the modern explosion of modern communication media. Effective communication is critical regardless of the devices used or the distances over which we are communicating.~~

~~The study of language helps students to control their lives and become more effective thinkers through communication, reflection, and understanding. To develop good thinking strategies, students must become engaged as active learners. To help them improve, students need to practice English language arts skills and receive frequent feedback across all areas of study. Parents, teachers, and other adults must encourage the interest in language that students bring with them when they first enter school. Collectively, the English language arts constitute both a discipline in its own right, like mathematics or science, and a means of communicating about all other disciplines. Without a command of these English language arts, it is difficult to think about, understand, or explain other disciplines.~~

~~**Literacy Skills Across the Content Areas** - The English Language Arts Standards describe the knowledge and skills all students need to be successful. These skills are important for career, college, and citizenship. These skills are also essential as students progress through their Pre-K-Diploma experience for accessing and sharing knowledge across content areas. Schools and teachers must take particular care to support and hold students accountable for the application of the performance indicators related to research, analysis of media, informational/position-taking writing, informational reading, listening, and speaking, where applicable, across all content areas. Maine's business community and higher education institutions have formally and informally underscored this need for effective communication and cross-content literacy.~~

~~**Research** – Research is an essential skill for success in the workplace, in college, and in life. All students should be able to locate information to support decisions and answer questions. Schools must ensure that the skills and knowledge of research are applied in all content areas.~~

~~**Reading and Writing Processes** - The English Language Arts Standards attempt to present the processes of reading, writing and the varied genres related to the two in a clear, concise format. This approach may create the misperception that these aspects of English language arts are linear and entirely discrete whereas they are often dynamic, iterative processes and sometimes overlapping constructs. Schools and teachers must recognize and accommodate this complexity in their student instruction.~~

~~**Text Complexity** - The use of reading standards is incomplete without a consideration of text complexity. The standards explain the knowledge and skills of reading. Text complexity provides a common understanding of the difficulty of the reading material to which the standards are applied. A grade appropriate span of text complexity can be determined in various ways including the use of reading lists, teacher judgment, and other standardized measures. An understanding of a student's reading ability, as defined by the text complexity that the student can successfully comprehend, is an important diagnostic tool for teachers as they work to advance the student's skills and ability to use those skills with increasingly complex texts. There are a number of variables that contribute to the complexity of any text including word difficulty, sentence complexity, familiarity of content, required background knowledge, organization of the text, unity of the writing, quality and rigor of the writing, and text length. The goal of the Maine *Learning Results* is to ensure that all students can read and comprehend texts that reflect the text complexity required for career, college, and citizenship.~~

~~**Grade Appropriate Span of Text Complexity** - The phrase grade appropriate span of text complexity refers to the range of complexity appropriate for the identified grade or grade span.~~

~~**OUTLINE OF ENGLISH LANGUAGE ARTS STANDARDS AND PERFORMANCE INDICATOR LABELS**~~

~~**A. Reading**~~
~~**1. Interconnected Elements: Comprehension, Vocabulary, Alphabetics, Fluency**~~
~~**2. Literary Texts**~~
~~**3. Informational Texts**~~
~~**4. Persuasive Texts**~~
~~**B. Writing**~~
~~**1. Interconnected Elements**~~
~~**2. Narrative**~~
~~**3. Argument/Analysis**~~
~~**4. Persuasive**~~
~~**5. Practical Application**~~
~~**C. Research**~~
~~**1. Research**~~
~~**D. Language**~~
~~**1. Grammar and Usage**~~
~~**2. Mechanics**~~
~~**E. Listening and Speaking**~~
~~**1. Listening**~~
~~**2. Speaking**~~
~~**F. Media**~~
~~**1. Analysis of Media**~~

~~**A. <u>READING</u>: Students read to comprehend, interpret, analyze, evaluate, and appreciate literary and expository texts by using a variety of strategies. They connect essential ideas, evaluate arguments, and analyze the various perspectives and ideas presented in a variety of literary and expository texts.**~~

~~**A1 Interconnected Elements: Comprehension, Vocabulary, *Alphabetics, Fluency***~~

~~**Pre-K-2 Performance Indicators & Descriptors**~~
~~**Students read texts, within a grade appropriate span of text complexity, and apply their knowledge and strategies of comprehension, vocabulary, *alphabetics,* and *fluency*.**~~ ~~a. Use comprehension strategies to understand texts within a grade appropriate span of text complexity.~~ ~~b. Develop vocabulary using knowledge of word parts and relationships among words including action words and different words that describe similar meanings.~~ ~~c. Demonstrate *phonemic awareness* and use *phonics* to decode new words.~~ ~~d. Read fluently and accurately with appropriate pacing and expression.~~ ~~e. Demonstrate comprehension by making logical predictions based on text or stating connections made.~~

~~**A1 Interconnected Elements: Comprehension, Vocabulary, *Alphabetics, Fluency***~~

~~**Performance Indicators & Descriptors**~~					
~~**3**~~	~~**4**~~	~~**5**~~	~~**6**~~	~~**7**~~	~~**8**~~
~~**Students read and draw conclusions from texts, within a grade appropriate span of text complexity, by applying their knowledge and strategies of comprehension, vocabulary, *alphabetics,* and *fluency*.**~~	~~**Students read and draw conclusions from texts, within a grade appropriate span of text complexity, by applying their knowledge and strategies of comprehension, vocabulary, *alphabetics,* and *fluency*.**~~	~~**Students read and draw conclusions from texts, within a grade appropriate span of text complexity, by applying their knowledge and strategies of comprehension, vocabulary, *alphabetics*, and *fluency*.**~~	~~**Students read and make generalizations from texts, within a grade appropriate span of text complexity, by applying their knowledge and strategies of comprehension, vocabulary, *alphabetics*, and *fluency*.**~~	~~**Students read and make generalizations from texts, within a grade appropriate span of text complexity, by applying their knowledge and strategies of comprehension, vocabulary, *alphabetics*, and *fluency*.**~~	~~**Students read and make generalizations from texts, within a grade appropriate span of text complexity, by applying their knowledge and strategies of comprehension, vocabulary, *alphabetics*, and *fluency*.**~~
~~a. Use a range of strategies as they read including constant monitoring, searching, connecting, and inferring to~~	~~a. Use a range of strategies as they read including constant monitoring, searching, connecting, and inferring to~~	~~a. Use a range of strategies as they read including constant monitoring, searching, connecting, and inferring to~~	- ~~a. Use a range of before, during, and after *reading strategies* to deepen their understanding of text(s).~~	~~a. Use a range of before, during, and after *reading strategies* to deepen their understanding of text(s).~~	~~a. Use a range of before, during, and after *reading strategies* to deepen their understanding of text(s).~~

~~Performance Indicators & Descriptors~~					
~~3~~	~~4~~	~~5~~	~~6~~	~~7~~	~~8~~
~~deepen their understanding of text(s).~~ ~~b. Demonstrate ownership of appropriate vocabulary by effectively using a word in different contexts and for different purposes.~~ ~~c. Determine the meaning of unknown words by using a variety of strategies including using the *context* of the text, word connections, and a dictionary.~~ ~~d. Use *phonics* including *syllable types*, *word parts*, word families and common *prefixes* and *suffixes* to read fluently and build meaning as they read.~~ ~~e. Fluently and accurately read text, within a grade appropriate span of text complexity, using appropriate pacing, phrasing, intonation,~~	~~deepen their understanding of text(s).~~ ~~b. Demonstrate ownership of appropriate vocabulary by effectively using a word in different contexts and for different purposes.~~ ~~c. Determine the meaning of unknown words by using a variety of strategies including applying knowledge of synonyms, antonyms, *homophones*, and *homographs*.~~ ~~d. Use *phonics* including *word parts* and common *root words* to read fluently and build meaning as they read.~~ ~~e. Fluently and accurately read text, within a grade appropriate span of text complexity, using appropriate pacing, phrasing, intonation, and expression.~~	~~deepen their understanding of text(s).~~ ~~b. Demonstrate ownership of appropriate vocabulary by effectively using a word in different contexts and for different purposes.~~ ~~c. Determine the meaning of unknown words by using a variety of strategies including distinguishing and interpreting words with multiple meanings and using word, *context cues*.~~ ~~d. Use *phonics* including *word parts* and less common *root words* to read fluently and build meaning as they read.~~ ~~e. Fluently and accurately read text, within a grade appropriate span of text complexity, using appropriate pacing, phrasing, intonation,~~	~~b. Demonstrate ownership of appropriate vocabulary by effectively using a word in different contexts and for different purposes.~~ ~~c. Determine the meaning of unknown words by using a variety of strategies including *context cues*, definition, example, restatement, and compare/contrast.~~ ~~d. Use *phonics*, *word parts*, and word relationships when necessary to maintain fluency and meaning as they read.~~ ~~e. Fluently and accurately read text, within a grade appropriate span of text complexity, using appropriate pacing, phrasing, intonation, and expression.~~ ~~f. Demonstrate comprehension by summarizing and~~	~~b. Demonstrate ownership of appropriate vocabulary by effectively using a word in different contexts and for different purposes.~~ ~~c. Determine the meaning of unknown words by using a variety of strategies including understanding and explaining that similar and related words can express different *shades of meaning*.~~ ~~d. Use the origins and meanings of foreign words that are frequently used in English to aid comprehension as they read.~~ ~~e. Fluently and accurately read text, within a grade appropriate span of text complexity, using appropriate pacing, phrasing, intonation, and expression.~~	~~b. Demonstrate ownership of appropriate vocabulary by effectively using a word in different contexts and for different purposes.~~ ~~c. Determine the meaning of unknown words by using a variety of strategies including the *connotative* and *denotative* meaning of words.~~ ~~d. Use knowledge of Greek, Latin, and Anglo-Saxon *roots* and *word parts* to maintain fluency and meaning as they read science, social studies, and mathematics texts.~~ ~~e. Fluently and accurately read text, within a grade appropriate span of text complexity, using appropriate pacing, phrasing, intonation, and expression.~~

~~**Performance Indicators & Descriptors**~~					
~~**3**~~	~~**4**~~	~~**5**~~	~~**6**~~	~~**7**~~	~~**8**~~
~~and expression.~~ ~~f. Demonstrate comprehension of text(s) by stating connections or inferences made.~~	~~f. Demonstrate comprehension of text(s) by stating connections or inferences made and stating questions or conclusions that indicate deeper understanding(s).~~	~~and expression.~~ ~~f. Demonstrate deep comprehension that goes beyond the text(s) by stating connections or inferences made and explaining relationships among prior knowledge and the conclusions and connections made.~~	~~making generalizations of whole texts, parts of texts, and across texts.~~	~~f. Demonstrate comprehension by summarizing, generalizing, drawing conclusions, making judgments, and making connections between prior knowledge and multiple texts.~~	~~f. Demonstrate comprehension by summarizing, generalizing, drawing conclusions, making judgments, interpreting text, and synthesizing information within and across texts.~~

~~**A1 Interconnected Elements: Comprehension, Vocabulary, *Alphabetics, Fluency***~~

~~**9-Diploma Performance Indicators & Descriptors**~~
~~**Students read and evaluate texts, within a grade appropriate span of text complexity, by applying their knowledge and strategies of comprehension, vocabulary, *alphabetics*, and *fluency*.**~~ ~~a. Use a flexible range of before, during, and after *reading strategies* to deepen understanding of the author's message.~~ ~~b. Demonstrate ownership of appropriate vocabulary effectively using a word in different contexts and for different purposes.~~ ~~c. Determine the meaning of unknown words by analyzing the *context* in which they are used, using reference sources, and applying knowledge of *word parts* and their meanings.~~ ~~d. Pronounce and recognize foreign words, *tier 3 words* across all content areas, and specific literary terms to enhance comprehension of complex texts.~~ ~~e. Fluently and accurately read text using appropriate pacing, phrasing, intonation, and expression.~~ ~~f. Demonstrate comprehension by evaluating texts using established criteria.~~

~~**A2 Literary Texts**~~

~~**Pre-K-2 Performance Indicators & Descriptors**~~
~~***Students read fiction, nonfiction, drama, and poetry, within a grade appropriate span of text complexity.***~~ ~~a. Identify and describe *settings* and *characters*.~~ ~~b. Retell the sequence of events and include essential details.~~

~~c. Answer questions about information found directly in the text.~~
~~d. Read dramatic scripts with support.~~
~~e. Read a variety of *poems* with support.~~

~~A2 Literary Texts~~

~~Performance Indicators & Descriptors~~					
~~3~~	**~~4~~**	**~~5~~**	**~~6~~**	**~~7~~**	**~~8~~**
~~Students read *fiction*, *nonfiction*, *drama*, and *poetry*, within a grade appropriate span of text complexity.~~	**~~Students read *fiction*, *nonfiction*, *drama*, and *poetry*, within a grade appropriate span of text complexity.~~**	**~~Students read *fiction*, *nonfiction*, *drama*, and *poetry*, within a grade appropriate span of text complexity.~~**	**~~Students read *fiction*, *nonfiction*, *drama*, and *poetry*, within a grade appropriate span of text complexity, and analyze the characteristics noting how structural features and common literary devices help shape the reader's response.~~**	**~~Students read *fiction*, *nonfiction*, *drama*, and *poetry*, within a grade appropriate span of text complexity, and analyze the characteristics noting how structural features and common literary devices help shape the reader's response.~~**	**~~Students read *fiction*, *nonfiction*, *drama*, and *poetry*, within a grade appropriate span of text complexity, and analyze the characteristics, noting how structural features and common literary devices help shape the reader's response.~~**
~~a. Identify and describe what characters are like based on what they say or do and by how the author or illustrator portrays them.~~ ~~b. Explain the basic *plots* of various texts (realistic fiction, historical fiction, classic fairy tales, myths, folktales, legends, or fables) by identifying the problem and solution in relation to the other story elements.~~ ~~c. Identify the speaker in a selection to aid comprehension.~~ ~~d. Identify and explain *literary devices*, including similes and exaggeration, to~~	~~a. Use knowledge of the situation, setting, and a *character's* traits, motivations, and feelings to determine the causes for that *character's* actions.~~ ~~b. Identify the main events of the *plot* including the cause and the effect of events on future actions and the major *theme(s)*.~~ ~~c. Define "narrator" and identify the *narrator* or speaker in a selection or story to aid comprehension.~~ ~~d. Identify and describe the effect of common *literary devices* on the reader, including *figurative language* and~~	~~a. Make inferences about *characters'* actions and explain how their behaviors affect the *plot* and/or *theme*.~~ ~~b. Summarize texts and select representative passages for support to identify the main problem or *conflict* and explain how it is resolved.~~ ~~c. Identify the speaker or *narrator* in a selection and tell whether the speaker or narrator is a character involved in the story.~~ ~~d. Identify and define the function of *figurative language* and the use of *literary devices*~~	- ~~a. Describe external and internal *conflicts of the characters* and their effect on the *plot*.~~ ~~b. Analyze the influence of the setting on the problem and its resolution.~~ ~~c. Explain the difference between *first-person* and *third-person narration*.~~ ~~d. Explain how the effects of common *literary devices*, including *imagery*,~~	~~a. Analyze an author's characterization techniques including the *character's* thoughts, words, and actions; the *narrator's* description; and the thoughts, words, and actions of other characters.~~ ~~b. Identify events that advance the *plot* and determine how each event explains past or present action or foreshadows future~~	~~a. Analyze the effect of the qualities of a *character* on the *plot* and on the resolution of the conflict.~~ ~~b. Evaluate the structural elements of the *plot*, such as subplots, parallel episodes, and climax; the *plot's* development; and the way in which conflicts are (or are not) addressed and resolved.~~ ~~c. Explain how different~~

Performance Indicators & Descriptors					
3	**4**	**5**	**6**	**7**	**8**
understand the text. e. Recognize *theme(s)* that are explicitly stated in text(s) to aid comprehension. f. Explain how *poems* are different from other kinds of *fiction* and demonstrate understanding by stating what a poem is about. g. Identify the main purpose of a passage or a particular part of a passage to aid comprehension.	*symbolism*, to understand the text. e. Explain *theme(s)* that are explicitly stated in text(s). f. Identify *rhyme, rhythm, alliteration*, and *onomatopoeia* in *poetry* and use this knowledge to understand poems. g. Identify the main purpose of a passage or particular parts of a passage to aid comprehension.	including *symbolism*, to understand the text. e. Explain that *theme* refers to the central ideas or meaning of a selection and identify theme(s) whether they are implied or stated directly. f. Identify and describe the function of common *literary devices* including *simile, alliteration*, *idioms*, simple *metaphors*, and *imagery* in *poetry* and use this knowledge to understand poems. g. Identify the main purpose of a poem, passage, or particular parts of a passage to aid comprehension.	*symbolism*, or *metaphors*, in a variety of fictional and literary nonfiction texts, help the reader understand the text. e. Describe the *theme* of a selection, whether implied or stated directly. f. Identify how meaning is conveyed in poetry through *figurative language, rhythm, alliteration*, and *rhyme*. g. Identify various genres of literature and their purposes.	action. c. Contrast points of view including first person, third person, limited and omniscient in a literary text. d. Identify the relationship between the use of *literary devices* and a writer's style to understand the text. e. Compare how similar themes are presented in different works. f. Identify how meaning is conveyed in *poetry* through word choice, sentence structure, line length, and punctuation. g. Analyze the characteristics of various genres of literature and their purposes.	points of view can affect the overall theme of the work. d. Analyze the *literary devices* that define a writer's style and use those elements to interpret the text. e. Identify and analyze recurring *themes* that appear frequently across traditional and contemporary works. f. Describe the use of *diction, figurative language*, repetition, *rhyme* and *tone* to convey meaning in *poetry*. g. Evaluate the characteristics of various genres of literature and their purposes.

A2 Literary Texts

9-Diploma Performance Indicators & Descriptors
Students read text, within a grade appropriate span of text complexity, and present analyses of *fiction, nonfiction, drama*, and *poetry*, using excerpts from the text to defend their assertions.

~~a. Analyze the characters' external and internal *conflicts*.~~
~~b. Analyze the difference between *first-person and third-person narration* and the effect of *point of view* on a reader's interpretation of a text.~~
~~c. Determine the effects of common *literary devices* on the *style* and *tone* of a text.~~
~~d. Evaluate the *theme* or *themes*, whether explicitly stated or implied, in a literary text.~~
~~e. Identify, compare, and analyze recurring themes across works.~~
~~f. Analyze how meaning is conveyed in *poetry* through *diction, figurative language*, repetition, and *rhyme*.~~
~~g. Compare types of *poetry*.~~
~~h. Evaluate the effective use of a genre of literature related to its intended purpose and audience.~~

~~**A3 Informational Texts**~~

~~**PreK-2 Performance Indicators & Descriptors**~~
~~**Students read *informational texts*, within a grade appropriate span of text complexity, for different purposes.**~~ ~~a. Ask and answer relevant questions.~~ ~~b. Restate facts from the text.~~ ~~c. Follow one-step and two-step written instructions.~~

~~**A3 Informational Texts**~~

~~**Performance Indicators & Descriptors**~~					
~~**3**~~	~~**4**~~	~~**5**~~	~~**6**~~	~~**7**~~	~~**8**~~
~~**Students read and summarize *informational texts*, within a grade appropriate span of text complexity, for different purposes.**~~ ~~a. Generate questions, with support that can be answered using *text features* and information found within the text.~~	~~**Students read, paraphrase, and summarize *informational texts*, within a grade appropriate span of text complexity, for different purposes.**~~ ~~a. Create questions that can be answered by the text using *text features* and information found~~	~~**Students read, paraphrase, and summarize *informational texts*, within a grade appropriate span of text complexity, for different purposes.**~~ ~~a. Create and revise questions that can be answered by using *text features* and information found~~	~~**Students read various *informational texts*, within a grade appropriate span of text complexity, making decisions about usefulness based on purpose, noting how the *text structures* affect the information presented.**~~ ~~a. Create and revise questions that can be~~	~~**Students read various *informational texts*, within a grade appropriate span of text complexity, making decisions about usefulness based on purpose, noting how the *text structures* affect the information presented.**~~ ~~a. Create and revise questions that can be~~	~~**Students read multiple *informational texts*, within a grade appropriate span of text complexity, making decisions about usefulness based on purpose, noting how the *text structures* affect the information presented.**~~ ~~a. Create and revise questions that can be~~

Performance Indicators & Descriptors					
3	**4**	**5**	**6**	**7**	**8**
b. Use organizational *text features* including titles, tables of contents, chapter headings, a glossaries, an index, illustrations, and maps to locate information or to aid comprehension. c. Identify answers in the text or important ideas to demonstrate understanding. d. Make reasonable statements about text. e. Follow simple written instructions. f. Identify the main reason or purpose for a particular section of text to aid comprehension.	within the text. b. Use organizational *text features* including headings and sub-headings, bullets, bold-face fonts, illustrations, maps, and charts to locate information or to aid comprehension. c. Identify the *main idea(s)* of and details from the text which support the *main idea(s)* succinctly stating this information. d. Draw conclusions about information from text. e. Follow multi-step written instructions with four or more steps. f. Identify the main purpose of a text, particular paragraphs, or a section of the text to aid comprehension.	within the text. b. Use *text features* including diagrams, illustrations, charts, and maps to aid comprehension. c. Identify, summarize, or paraphrase the *main ideas* and details presented in texts and use evidence from the text to support those ideas. d. Distinguish between facts and opinions in text and/or draw conclusions from text. e. Follow multiple-step instructions which may be related to a content area text. f. Identify the main purpose of a text, particular paragraphs, or sections of the text to aid comprehension.	answered by using *text structures* and information found within texts. b. Identify the *text structures* of informational publications including newspapers, magazines, and online sources and use them to obtain information. c. Identify and trace the development of an author's argument, purpose, position, or perspective to aid comprehension. d. Make reasonable statements and draw conclusions that are supported with evidence from the text. e. Follow multi-step instructions related to a content area text or technical manual.	answered by using *text structures* and information found within texts. b. Analyze the amount of coverage and organization of ideas in varied informational materials. c. Draw conclusions about a text and its purpose, and support them with evidence from the text. d. Make comparisons about information from several passages or articles from different texts. e. Follow multi-step instructions in a technical manual or content area text to complete a task or use a simple device.	answered by using *text structures* and information found within texts. b. Analyze differences in the structures and purposes of varied informational materials. c. Evaluate the appropriateness of the evidence presented for an author's conclusions and evaluate whether the author adequately supports inferences. d. Draw conclusions about information from multiple texts and support them with evidence from the texts. e. Follow multi-step instructions to complete an application or a complex task.

A3 Informational Texts

9-Diploma Performance Indicators & Descriptors
Students evaluate the validity, truthfulness, and usefulness of ideas presented in *informational texts*, within a grade appropriate span of text complexity, noting how

~~**the *text features* and *text structures* affect the information presented.**~~

- ~~a. Evaluate the extent to which the author's conclusions can be logically drawn from the provided evidence.~~
- ~~b. Evaluate the data contained in tables, charts, graphics, etc. for accuracy, credibility, and relevancy.~~
- ~~c. Evaluate the effect(s) of rhetorical devices on the interpretation of information.~~
- ~~d. Evaluate the effective use, purposes, and intended audiences of various types of informational texts.~~

~~**A4 Persuasive Texts**~~

~~**PreK-2 Performance Indicators & Descriptors**~~
~~**No performance indicator**.~~ ~~Although no performance indicators are stated, students are expected to have instructional experiences that help them to understand and explain that sometimes authors write to convince readers of something.~~

~~**A4 Persuasive Texts**~~

~~**Performance Indicators & Descriptors**~~					
~~**3**~~	~~**4**~~	~~**5**~~	~~**6**~~	~~**7**~~	~~**8**~~
~~**No performance indicator.**~~ ~~Although no performance indicators are stated, students are expected to have instructional experiences that help them to identify the purpose of a text, the main idea and the supporting details and to explain that sometimes authors write to convince readers of something.~~	~~**No performance indicator.**~~ ~~Although no performance indicators are stated, students are expected to have instructional experiences that help them to identify the purpose for a text or portion of a text, the central argument and its supporting details, and to explain that sometimes authors write to convince readers of something.~~	~~**No performance indicator**.~~ ~~Although no performance indicators are stated, students are expected to have instructional experiences that help them to identify the purpose for a text or portion of a text, the central argument and its supporting details, to differentiate between facts and opinions and to explain that sometimes authors write to convince~~	~~**Students evaluate the information in persuasive texts, within a grade appropriate span of text complexity, noting how the *structural features* and *rhetorical devices* affect the information and argument(s) presented in these texts.**~~ ~~a. Recognize arguments for and against issues.~~ ~~b. Identify the author's position or~~	~~**Students evaluate the information in persuasive texts, within a grade appropriate span of text complexity, noting how the *structural features* and *rhetorical devices* affect the information and argument(s) presented in these texts.**~~ ~~a. Recognize organizational patterns of compare/contrast,~~	~~**Students evaluate the information in persuasive texts, within a grade appropriate span of text complexity, noting how the *structural features* and *rhetorical devices* affect the information and argument(s) presented in these texts.**~~ ~~a. Explain how organizational patterns shape an author's argument.~~

~~Performance Indicators & Descriptors~~					
~~3~~	~~4~~	~~5~~	~~6~~	~~7~~	~~8~~
		~~readers of something.~~	~~perspective.~~ ~~c. Distinguish among facts, supported inferences, and opinions.~~ ~~d. Summarize the author's position or perspective.~~ ~~e. Identify purpose and intended audience of a text.~~ ~~f. Identify rhetorical devices an author uses to persuade the reader including *bandwagon, peer pressure, repetition,* and *testimonial*.~~	~~proposition/support, and problem/solution in an argument to aid comprehension.~~ ~~b. Identify and use ways to detect bias.~~ ~~c. Identify problems with an author's use of figures of speech, logic, or reasoning.~~ ~~d. Make reasonable judgments about a text through accurate, supporting evidence.~~ ~~e. Identify purpose and intended audience of a text.~~ ~~f. Identify rhetorical devices an author uses to persuade the reader including *bandwagon, peer pressure, repetition, testimonial, hyperbole*, and *loaded words*.~~	~~b. Analyze the author's perspective, noting instances of *bias, stereotyping*, and generalizations.~~ ~~c. Explain instances of *propaganda* and faulty reasoning.~~ ~~d. Evaluate positions presented in text(s) and take a supported stand.~~ ~~e. Identify purpose and intended audience of a text.~~ ~~f. Identify rhetorical devices an author uses to persuade the reader including *bandwagon, peer pressure, repetition, testimonial, hyperbole, loaded words, transfer, amplification*, and *extended metaphor*.~~

~~A4 Persuasive Texts~~

~~9-Diploma Performance Indicators & Descriptors~~
~~Students evaluate the validity, truthfulness, and usefulness of ideas presented in persuasive texts, within a grade appropriate span of text complexity, noting how the *structural features* and *rhetorical devices* affect the information and argument(s) presented.~~ ~~a. Evaluate the logic of persuasive texts, noting instances of unsupported inferences and *fallacious reasoning*.~~

~~b. Recognize and explain the use and misuse of forms of nuance such as ambiguity, contradiction, irony, and over-or-understatement in persuasive texts.~~
~~c. Identify and describe the effect of *figurative language* and other *rhetorical devices*; explain why they do or do not contribute to the overall effectiveness of the argument.~~
~~d. Analyze the purpose(s) of a persuasive text; describe the intended audience, and assess the overall effectiveness of text.~~

~~B. WRITING: Students write to express their ideas and emotions, to describe their experiences, to communicate information, and to present or analyze an argument.~~

~~B1 Interconnected Elements~~

~~Performance Indicators & Descriptors~~			
~~Pre-K-2~~	**~~3-5~~**	**~~6-8~~**	**~~9-Diploma~~**
~~Students use a *writing process* to communicate their ideas.~~ ~~a. Select a focus for writing and develop an idea, including a beginning, middle, and end.~~ ~~b. Respond to clarifying questions and suggested revisions.~~ ~~c. Edit, with assistance, for correct grammar, usage, and mechanics.~~ ~~d. Create *legible* final drafts.~~	**~~Students use a *writing process* with an emphasis on the development of a central idea, for a variety of audiences and purposes.~~** ~~a. Select a purpose for writing.~~ ~~b. Pre-write using graphic organizers or other structures to organize their ideas.~~ ~~c. Establish an organizing structure and maintain a consistent focus.~~ ~~d. Include an introduction and conclusion.~~ ~~e. Write coherent paragraphs that have supporting sentences and a concluding sentence.~~ ~~f. Revise original drafts to improve coherence, provide better descriptive details, and to convey *voice*.~~ ~~g. Edit for correct grammar, usage, and mechanics.~~ ~~h. Create *legible* final drafts.~~	**~~Students use a *writing process* to communicate for a variety of audiences and purposes.~~** ~~a. Determine a purpose for writing.~~ ~~b. Decide which information is included to achieve the desired purpose.~~ ~~c. Revise drafts to improve focus, effect, and *voice* incorporating *peer response* when appropriate.~~ ~~d. Edit for correct grammar, usage, and mechanics.~~ ~~e. Write to achieve a specific purpose.~~ ~~f. Create *legible* final drafts.~~	**~~Students use a *writing process* to develop an appropriate *genre*, exhibiting an explicit *organizational structure*, perspective, and *style* to communicate with target audiences for specific purposes.~~** ~~a. Locate, summarize, and synthesize information from *primary* and *secondary sources*, as necessary.~~ ~~b. Apply aspects of various *genres* for rhetorical effect, strong diction, and distinctive voice.~~ ~~c. Revise drafts to improve synthesis of information from sources, ensuring that the *organizational structure*, perspective, and *style* are effective for the targeted audience and purpose.~~ ~~d. Edit for correct grammar, usage, and mechanics.~~ ~~e. Create *legible* final drafts.~~

~~B2 Narrative~~

~~Performance Indicators & Descriptors~~			
~~Pre-K-2~~	**~~3-5~~**	**~~6-8~~**	**~~9-Diploma~~**
~~Students write stories that describe an experience.~~ ~~a. Include descriptive details that enable the reader to create mental images.~~	**~~Students write *narratives* that relate events, ideas, observations, or recollections.~~** ~~a. Provide enough details and description in an organized manner so the reader can imagine the event or experience.~~ ~~b. Develop major events, settings, and characters and deal with problems and solutions in a story.~~ ~~c. Provide insight into why the selected event or experience is memorable.~~ ~~d. Include sensory details.~~	**~~Students write *narratives* that convey complex ideas, observations, events, or reflections.~~** ~~a. Establish a *plot* or other narrative structure, *point of view*, setting, and *conflict*.~~ ~~b. Develop *characters*.~~ ~~c. Use a range of *narrative strategies* for effect including dialogue and suspense.~~ ~~d. Use *stylistic devices* including figurative language and *point of view* to clarify, enhance, and develop ideas.~~	**~~Students embed *narrative* writing in a written text when appropriate to the audience and purpose.~~** ~~a. Use *diction, syntax, imagery*, and *tone* to create a distinctive *voice*.~~ ~~b. Organize ideas in a logical sequence with effective transitions.~~

~~B3 Argument/Analysis~~

~~Performance Indicators & Descriptors~~			
~~Pre-K-2~~	**~~3-5~~**	**~~6-8~~**	**~~9-Diploma~~**
~~Students write to inform an audience on a specific topic.~~ ~~a. Write brief descriptions of objects, people, places, or events.~~ ~~b. Record and share, in writing, information that has been gathered.~~	**~~Students write to identify and explain a position to an identified audience.~~** ~~a. Summarize information from reading, listening, or viewing.~~ ~~b. Write about a central question or idea by using relevant supporting facts and details.~~	**~~Students write *academic essays* that state a clear position, supporting the position with relevant evidence.~~** ~~a. Summarize and paraphrase and/or explain information from reading, listening, or viewing.~~ ~~b. Write essays that support an idea and build a *logical* argument excluding extraneous information and differentiating between facts and opinions.~~	**~~Students write *academic essays* that structure ideas and arguments in a sustained and logical fashion.~~** - ~~a. Explain and evaluate information from reading, listening, or viewing.~~ ~~b. Write thesis-driven essays that build a logical argument and support assertions with examples and evidence that are accurate, credible, and relevant.~~

Words in *blue italics* are defined in the glossary available online at http://www.maine.gov/education/lres/review/glossary.pdf

Highlighted = Maine Department of Education Regulation 131

~~B4 Persuasive~~

~~Performance Indicators & Descriptors~~			
~~Pre-K-2~~	**~~3-5~~**	**~~6-8~~**	**~~9-Diploma~~**
~~Students write to explain likes and dislikes.~~ ~~a. Support opinions with examples.~~	**~~Students write to persuade a targeted audience.~~** ~~a. Establish a clear position on a topic and support the position with relevant evidence.~~	**~~Students write *persuasive essays* addressed to a specific audience for a particular purpose.~~** ~~a. Employ a variety of persuasive techniques, including presenting alternate views objectively or addressing potential counterclaims, in an essay that supports an idea using facts, supported inferences, and/or opinions appropriate to the audience and purpose and is intended to influence the opinions, beliefs, or positions of others.~~	**~~Students write *persuasive essays* exhibiting logical reasoning and rhetorical techniques.~~** ~~a. Employ a variety of persuasive techniques including anticipating, addressing, and refuting potential counterclaims in a thesis-driven logical argument to influence the opinions, beliefs, or positions of others.~~

~~B5 Practical Application~~

~~Performance Indicators & Descriptors~~			
~~Pre-K-2~~	**~~3-5~~**	**~~6-8~~**	**~~9-Diploma~~**
~~Students convey simple needs in writing.~~ ~~a. Write a personal letter.~~ ~~b. Complete simple informational forms.~~ ~~c. Write one-step and two-step directions for completing a simple task.~~	**~~Students write letters, other requests for information or directions for completing a process.~~** ~~a. Write a letter including a date, salutation, body, closing, signature and, when appropriate, an inside address.~~ ~~b. Write multi-step directions for completing a task.~~	**~~Students write simple business letters and documents related to career development.~~** ~~a. Write information purposefully and succinctly to meet the needs of the audience.~~ ~~b. Write to convey specific requests for detailed information.~~ ~~c. Follow a conventional format for writing resumes, memoranda, and/or proposals.~~ ~~d. Write multi-step directions, with~~	**~~Students write personal communication and pieces related to educational development, career issues, and civic participation.~~** ~~a. Complete college, job, licensing, and/or scholarship applications.~~ ~~b. Write to request information.~~ ~~c. Write editorials.~~

Performance Indicators & Descriptors			
~~**Pre-K-2**~~	~~**3-5**~~	~~**6-8**~~	~~**9-Diploma**~~
		~~annotation where appropriate, for completing a task.~~	

~~**C. RESEARCH: Students engage in inquiry by developing research questions, accessing and verifying a variety of sources, communicating findings, and applying the conventions of documentation. Students present findings orally, in writing, or using mixed media.**~~

~~**C1 Research**~~

Performance Indicators & Descriptors			
~~**Pre-K-2**~~	~~**3-5**~~	~~**6-8**~~	~~**9-Diploma**~~
~~**Students answer research questions by gathering information from *print and non-print sources*.**~~ ~~a. Follow an established procedure for locating sources appropriate to reading level.~~ ~~b. Collect information for a specific purpose.~~ ~~c. Organize findings.~~ ~~d. Share information gathered using oral and visual examples.~~	~~**Students create, identify, and answer research questions by gathering information from *print and non-print sources* and documenting sources and communicating findings.**~~ ~~a. Identify key words and concepts related to research questions, making adjustments when appropriate.~~ ~~b. Locate and access information by using *text features*.~~ ~~c. Collect, evaluate, and organize information for a specific purpose.~~ ~~d. Communicate findings from a variety of *print and non-print sources*.~~ ~~e. Describe plagiarism and demonstrate appropriate *citation*.~~	~~**Students propose and revise research questions, collect information from a wide variety of *primary and/or secondary sources*, and follow the conventions of documentation to communicate findings.**~~ ~~a. Determine the nature and extent of information needed.~~ ~~b. Locate and access relevant information.~~ ~~c. Demonstrate facility with note-taking, organizing information, and creating bibliographies.~~ ~~d. Distinguish between *primary and secondary sources*.~~ ~~e. Evaluate and verify the credibility of the information found in *print and non-print sources*.~~ ~~f. Use additional sources to resolve contradictory information.~~ ~~g. Summarize and interpret information~~	~~**Students develop research questions and modify them as necessary to elicit, present, and critique evidence from a variety of *primary and secondary sources* following the conventions of documentation.**~~ ~~a. Select and apply research methods that are appropriate for the purpose of the inquiry.~~ ~~b. Make judgments about conflicting findings from different sources, incorporating findings from sources that are valid and refuting others.~~ ~~c. Synthesize information from varied sources and/or data gathered from fieldwork and interviews.~~ ~~d. Utilize media relevant to audience and purpose that extend and support oral, written, and visual communication.~~ ~~e. Create and present a coherent set of~~

~~Performance Indicators & Descriptors~~			
~~**Pre-K-2**~~	~~**3-5**~~	~~**6-8**~~	~~**9-Diploma**~~
		~~presented in varied sources, and/or from fieldwork, experiments, and interviews.~~ ~~h. Present findings by paraphrasing, quoting sources, and using proper *citation*.~~ ~~i. Use information ethically and legally.~~	~~findings that integrates paraphrasing, quotations, and proper citation. Access and present information ethically and legally.~~

~~**D. LANGUAGE: Students write and speak using the conventions of *Standard American English*. They apply knowledge of grammar and usage when reading to aid comprehension. They know and apply rules of mechanics and spelling to enhance the effectiveness and clarity of communication.**~~

~~**D1 Grammar and Usage**~~

~~Performance Indicators & Descriptors~~			
~~**Pre-K-2**~~	~~**3-5**~~	~~**6-8**~~	~~**9-Diploma**~~
~~**Students demonstrate an understanding of the parts of speech and simple sentence structures to communicate.**~~ ~~a. Identify and use nouns and verbs correctly.~~ ~~b. Use simple sentences.~~	~~**Students use parts of speech and vary sentence structure to communicate.**~~ ~~a. Use forms of nouns, verbs, adjectives, adverbs, prepositions, conjunctions, pronouns, and interjections correctly.~~ ~~b. Use simple, compound, and complex sentences.~~	~~**Students manipulate the parts of speech effectively and employ a variety of sentence structures to communicate.**~~ ~~a. Use forms of nouns, pronouns, verbs, adjectives and their modifiers, adverbs, prepositions, transitions, conjunctions, and interjections correctly.~~ ~~b. Use compound complex sentences.~~ ~~c. Use active and passive voices effectively.~~	~~**Students apply rhetorical skills when reading, writing, and speaking through their understanding of *Standard American English*.**~~ ~~a. Use appropriate *diction, syntax,* and *figurative language* to suit purpose, context, and audience.~~ ~~b. Use handbooks, style guides or other writing sources to confirm accuracy of *Standard American English.*~~

D2 Mechanics

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students apply the rules of capitalization, punctuation, and spelling to communicate. a. Use commas in the greeting and closure of a letter and in dates. b. Capitalize proper nouns and words at the beginning of sentences. c. Use periods, question marks, and exclamation points. d. Spell high frequency grade-level words. e. Use *phonics* patterns to aid in spelling.	**Students apply the rules of capitalization, punctuation, and spelling to communicate.** a. Use end marks correctly. b. Capitalize correctly. c. Spell high-frequency grade-level words.	**Students apply the rules of capitalization, punctuation, and spelling to communicate effectively.** a. Use correct capitalization and punctuation including commas and semi-colons. b. Correctly spell frequently misspelled words and common *homophones*.	**Students demonstrate the use of the structures and conventions of *Standard American English* in their communication.** a. Use appropriate punctuation, spelling, and sentence and paragraph structure to suit purpose, situation, and audience.

E. LISTENING AND SPEAKING: Students listen to comprehend and speak to communicate effectively.

E1 Listening

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students use early active listening skills. a. Ask relevant questions at appropriate times. b. Converse without interrupting. c. Follow one-step and two-step oral instructions.	**Students apply active listening skills.** a. Ask clarifying questions. b. Attend and respond appropriately to classmates and adults. c. Follow multi-step oral instructions.	**Students adjust listening strategies to understand formal and informal discussion, debates, or presentations and then apply the information.** a. Ask appropriate clarifying questions. b. Summarize and apply information presented. c. Acknowledge and build upon the ideas of others.	**Students adjust listening strategies for formal and informal discussion, debates, or presentations, and then evaluate the information.** a. Formulate clarifying questions. b. Examine and critique information presented. c. Expand on ideas presented by others.

E2 Speaking

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students use speaking skills to communicate. a. Make clear requests at appropriate times. b. Make simple presentations using eye contact. c. Use voice level appropriate to the situation. d. Share stories and information and support opinions using oral and visual examples.	**Students use active speaking skills to communicate effectively in a variety of contexts.** a. Explain ideas clearly and respond to questions with appropriate information. b. Speak using eye contact, clear enunciation, clear gestures for emphasis, and appropriate volume and rate. c. Share information summarized from reading, listening, or viewing and form a position on a topic, supporting the position with a variety of *print and non-print sources*.	**Students adjust speaking strategies for formal and informal discussions, debates, or presentations appropriate to the audience and purpose.** a. Organize and present information logically. b. Adjust volume, tone, eye contact, and gestures to suit the audience. c. Use conventions of *Standard American English*. d. Seek feedback and revise to improve effectiveness of communication. e. Select appropriate media, relevant to audience and purpose that support oral, written, and visual communication.	**Students determine speaking strategies for formal and informal discussions, debates, or presentations appropriate to the audience and purpose.** a. Choose and present appropriate information logically and ethically. b. Apply conventions of *Standard American English* to suit audience and purpose. c. Analyze feedback and revise delivery to improve effectiveness of communication. d. Select appropriate media, relevant to audience and purpose, to extend and support oral, written, and visual communication.

F MEDIA: Students recognize and can explain the effects that both *print and non-print sources* have on listeners, viewers, and readers, in order to develop an awareness of the effects that the media have on forming opinions and making decisions.

F1 Analysis of Media

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students understand that there are differences among the kinds of information in different forms of media.	**Students explain that the same information can have different effects when presented through different forms of media.**	**Students identify the various purposes, techniques, and/or effects used to communicate auditory, visual, and written information found in different forms of media.**	**Students analyze the effectiveness of auditory, visual, and written information used to communicate in different forms of media.**

~~**Performance Indicators & Descriptors**~~			
~~**Pre-K-2**~~	~~**3-5**~~	~~**6-8**~~	~~**9-Diploma**~~
~~a. Identify the different types of media in the daily lives of most people.~~ ~~b. Describe their reactions to a variety of *print and/or non-print sources*.~~	~~a. Compare the effects of the same kind of information as found in books, movies, newspapers, magazines, and/or on the Internet and television.~~ ~~b. Recognize that there are multiple roles and purposes of media.~~	~~a. Describe and evaluate the *text features* of visual and non-visual media.~~ ~~b. Explain the role of the media in shaping opinions.~~ ~~c. Note instances of *bias, stereotyping,* and *propaganda*.~~	~~a. Explain how visual and sound effects influence messages in various media.~~ ~~b. Explain the similarities and differences between the messages conveyed by *print and non-print sources*.~~ ~~c. Compare the role of *print and non-print sources,* including advertising, in shaping public opinion and noting instances of unsupported inferences, or *fallacious reasoning*.~~ ~~d. Select appropriate media, relevant to audience and purpose that extend and support oral, written, and visual communication.~~

Common Core Standards for English Language Arts

1. Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects K–5

1.1 College and Career Readiness Anchor Standards for Reading

The K–5 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to the College and Career Readiness (CCR) anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.

Key Ideas and Details

1.Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

2.Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

3.Analyze how and why individuals, events, and ideas develop and interact over the course of a text.

Craft and Structure

4.Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

5.Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

6.Assess how point of view or purpose shapes the content and style of a text.

Integration of Knowledge and Ideas

7.Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.*

8.Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.

9.Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

Range of Reading and Level of Text Complexity

10. Read and comprehend complex literary and informational texts independently and proficiently.

*Please see “Research to Build and Present Knowledge” in Writing and “Comprehension and Collaboration” in Speaking and Listening for additional standards relevant to gathering, assessing, and applying information from print and digital sources.

1.1.1 Reading Standards for Literature K–5

The following standards offer a focus for instruction each year and help ensure that students gain adequate exposure to a range of texts and tasks. Rigor is also infused through the requirement that students read increasingly complex texts through the grades. Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.

A. Kindergartners:	**B. Grade 1 students:**	**C. Grade 2 students:**
Key Ideas and Details		
1. With prompting and support, ask and answer questions about key details in a text.	**1.** Ask and answer questions about key details in a text.	**1.** Ask and answer such questions as *who*, *what*, *where*, *when*, *why*, and *how* to demonstrate understanding of key details in a text.
2. With prompting and support, retell familiar stories, including key details.	**2.** Retell stories, including key details, and demonstrate understanding of their central message or lesson.	**2.** Recount stories, including fables and folktales from diverse cultures, and determine their central message, lesson, or moral.
3. With prompting and support, identify characters, settings, and major events in a story.	**3.** Describe characters, settings, and major events in a story, using key details.	**3.** Describe how characters in a story respond to major events and challenges.
Craft and Structure		
4. Ask and answer questions about unknown words in a text.	**4.** Identify words and phrases in stories or poems that suggest feelings or appeal to the senses.	**4.** Describe how words and phrases (e.g., regular beats, alliteration, rhymes, repeated lines) supply rhythm and meaning in a story, poem, or song.
5. Recognize common types of texts (e.g., storybooks, poems).	**5.** Explain major differences between books that tell stories and books that give information, drawing on a wide reading of a range of text types.	**5.** Describe the overall structure of a story, including describing how the beginning introduces the story and the ending concludes the action.
6. With prompting and support, name the author and illustrator of a story and define the role of each in telling the story.	**6.** Identify who is telling the story at various points in a text.	**6.** Acknowledge differences in the points of view of characters, including by speaking in a different voice for each character when reading dialogue aloud.
Integration of Knowledge and Ideas		
7. With prompting and support, describe the relationship between illustrations and the story in which they appear (e.g., what moment in a story an illustration depicts).	**7.** Use illustrations and details in a story to describe its characters, setting, or events.	**7.** Use information gained from the illustrations and words in a print or digital text to demonstrate understanding of its characters, setting, or plot.
8. (Not applicable to literature)	**8.** (Not applicable to literature)	**8.** (Not applicable to literature)
9. With prompting and support, compare and contrast the adventures and experiences of characters in familiar stories.	**9.** Compare and contrast the adventures and experiences of characters in stories.	**9.** Compare and contrast two or more versions of the same story (e.g., Cinderella stories) by different authors or from different cultures.
Range of Reading and Level of Text Complexity		

10. Actively engage in group reading activities with purpose and understanding.	**10.** With prompting and support, read prose and poetry of appropriate complexity for grade 1.	**10.** By the end of the year, read and comprehend literature, including stories and poetry, in the grades 2–3 text complexity band proficiently, with scaffolding as needed at the high end of the range.

D. Grade 3 students:	E. Grade 4 students:	F. Grade 5 students:
Key Ideas and Details		
1. Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.	**1.** Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.	**1.** Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.
2. Recount stories, including fables, folktales, and myths from diverse cultures; determine the central message, lesson, or moral and explain how it is conveyed through key details in the text.	**2.** Determine a theme of a story, drama, or poem from details in the text; summarize the text.	**2.** Determine a theme of a story, drama, or poem from details in the text, including how characters in a story or drama respond to challenges or how the speaker in a poem reflects upon a topic; summarize the text.
3. Describe characters in a story (e.g., their traits, motivations, or feelings) and explain how their actions contribute to the sequence of events.	**3.** Describe in depth a character, setting, or event in a story or drama, drawing on specific details in the text (e.g., a character's thoughts, words, or actions).	**3.** Compare and contrast two or more characters, settings, or events in a story or drama, drawing on specific details in the text (e.g., how characters interact).
Craft and Structure		
4. Determine the meaning of words and phrases as they are used in a text, distinguishing literal from nonliteral language.	**4.** Determine the meaning of words and phrases as they are used in a text, including those that allude to significant characters found in mythology (e.g., *Herculean*).	**4.** Determine the meaning of words and phrases as they are used in a text, including figurative language such as metaphors and similes.
5. Refer to parts of stories, dramas, and poems when writing or speaking about a text, using terms such as *chapter*, *scene*, and *stanza*; describe how each successive part builds on earlier sections.	**5.** Explain major differences between poems, drama, and prose, and refer to the structural elements of poems (e.g., verse, rhythm, meter) and drama (e.g., casts of characters, settings, descriptions, dialogue, stage directions) when writing or speaking about a text.	**5.** Explain how a series of chapters, scenes, or stanzas fits together to provide the overall structure of a particular story, drama, or poem.
6. Distinguish their own point of view from that of the narrator or those of the characters.	**6.** Compare and contrast the point of view from which different stories are narrated, including the difference between first- and third-person narrations.	**6.** Describe how a narrator's or speaker's point of view influences how events are described.
Integration of Knowledge and Ideas		
7. Explain how specific aspects of a text's illustrations contribute to what is conveyed by the words in a story (e.g., create mood, emphasize aspects of a character or setting).	**7.** Make connections between the text of a story or drama and a visual or oral presentation of the text, identifying where each version reflects specific descriptions and directions in the text.	**7.** Analyze how visual and multimedia elements contribute to the meaning, tone, or beauty of a text (e.g., graphic novel, multimedia presentation of fiction, folktale, myth, poem).
8. (Not applicable to literature)	**8.** (Not applicable to literature)	**8.** (Not applicable to literature)
9. Compare and contrast the themes, settings, and plots of stories written by the same author about the same or similar characters (e.g., in books from a series).	**9.** Compare and contrast the treatment of similar themes and topics (e.g., opposition of good and evil) and patterns of events (e.g., the quest) in stories, myths, and traditional literature from different cultures.	**9.** Compare and contrast stories in the same genre (e.g., mysteries and adventure stories) on their approaches to similar themes and topics.

Range of Reading and Level of Text Complexity		
10. By the end of the year, read and comprehend literature, including stories, dramas, and poetry, at the high end of the grades 2–3 text complexity band independently and proficiently.	**10.** By the end of the year, read and comprehend literature, including stories, dramas, and poetry, in the grades 4–5 text complexity band proficiently, with scaffolding as needed at the high end of the range.	**10.** By the end of the year, read and comprehend literature, including stories, dramas, and poetry, at the high end of the grades 4–5 text complexity band independently and proficiently.

1.1.2 Reading Standards for Informational Text K–5

A. Kindergartners:	B. Grade 1 students:	C. Grade 2 students:
Key Ideas and Details		
1. With prompting and support, ask and answer questions about key details in a text.	**1.** Ask and answer questions about key details in a text.	**1.** Ask and answer such questions as *who*, *what*, *where*, *when*, *why*, and *how* to demonstrate understanding of key details in a text.
2. With prompting and support, identify the main topic and retell key details of a text.	**2.** Identify the main topic and retell key details of a text.	**2.** Identify the main topic of a multiparagraph text as well as the focus of specific paragraphs within the text.
3. With prompting and support, describe the connection between two individuals, events, ideas, or pieces of information in a text.	**3.** Describe the connection between two individuals, events, ideas, or pieces of information in a text.	**3.** Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text.
Craft and Structure		
4. With prompting and support, ask and answer questions about unknown words in a text.	**4.** Ask and answer questions to help determine or clarify the meaning of words and phrases in a text.	**4.** Determine the meaning of words and phrases in a text relevant to a *grade 2 topic or subject area.*
5. Identify the front cover, back cover, and title page of a book.	**5.** Know and use various text features (e.g., headings, tables of contents, glossaries, electronic menus, icons) to locate key facts or information in a text.	**5.** Know and use various text features (e.g., captions, bold print, subheadings, glossaries, indexes, electronic menus, icons) to locate key facts or information in a text efficiently.
6. Name the author and illustrator of a text and define the role of each in presenting the ideas or information in a text.	**6.** Distinguish between information provided by pictures or other illustrations and information provided by the words in a text.	**6.** Identify the main purpose of a text, including what the author wants to answer, explain, or describe.
Integration of Knowledge and Ideas		
7. With prompting and support, describe the relationship between illustrations and the text in which they appear (e.g., what person, place, thing, or idea in the text an illustration depicts).	**7.** Use the illustrations and details in a text to describe its key ideas.	**7.** Explain how specific images (e.g., a diagram showing how a machine works) contribute to and clarify a text.
8. With prompting and support, identify the reasons an author gives to support points in a text.	**8.** Identify the reasons an author gives to support points in a text.	**8.** Describe how reasons support specific points the author makes in a text.
9. With prompting and support, identify basic similarities in and differences between two texts on the same topic (e.g., in illustrations, descriptions, or procedures).	**9.** Identify basic similarities in and differences between two texts on the same topic (e.g., in illustrations, descriptions, or procedures).	**9.** Compare and contrast the most important points presented by two texts on the same topic.
Range of Reading and Level of Text Complexity		
10. Actively engage in group reading activities with purpose and understanding.	**10.** With prompting and support, read informational texts appropriately complex for grade 1.	**10.** By the end of year, read and comprehend informational texts, including history/social studies, science, and technical texts,

	in the grades 2–3 text complexity band proficiently, with scaffolding as needed at the high end of the range.

D. Grade 3 students:	E. Grade 4 students:	F. Grade 5 students:
Key Ideas and Details		
1. Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.	**1.** Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.	**1.** Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.
2. Determine the main idea of a text; recount the key details and explain how they support the main idea.	**2.** Determine the main idea of a text and explain how it is supported by key details; summarize the text.	**2.** Determine two or more main ideas of a text and explain how they are supported by key details; summarize the text.
3. Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.	**3.** Explain events, procedures, ideas, or concepts in a historical, scientific, or technical text, including what happened and why, based on specific information in the text.	**3.** Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.
Craft and Structure		
4. Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a *grade 3 topic or subject area.*	**4.** Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a *grade 4 topic or subject area.*	**4.** Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a *grade 5 topic or subject area.*
5. Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently.	**5.** Describe the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts, or information in a text or part of a text.	**5.** Compare and contrast the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts, or information in two or more texts.
6. Distinguish their own point of view from that of the author of a text.	**6.** Compare and contrast a firsthand and secondhand account of the same event or topic; describe the differences in focus and the information provided.	**6.** Analyze multiple accounts of the same event or topic, noting important similarities and differences in the point of view they represent.
Integration of Knowledge and Ideas		
7. Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur).	**7.** Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.	**7.** Draw on information from multiple print or digital sources, demonstrating the ability to locate an answer to a question quickly or to solve a problem efficiently.
8. Describe the logical connection between particular sentences and paragraphs in a text (e.g., comparison, cause/effect, first/second/third in a sequence).	**8.** Explain how an author uses reasons and evidence to support particular points in a text.	**8.** Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which point(s).
9. Compare and contrast the most important points and key details presented in two texts on the same topic.	**9.** Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.	**9.** Integrate information from several texts on the same topic in order to write or speak about the subject knowledgeably.
Range of Reading and Level of Text Complexity		

10. By the end of the year, read and comprehend informational texts, including history/social studies, science, and technical texts, at the high end of the grades 2–3 text complexity band independently and proficiently.	**10.** By the end of year, read and comprehend informational texts, including history/social studies, science, and technical texts, in the grades 4–5 text complexity band proficiently, with scaffolding as needed at the high end of the range.	**10.** By the end of the year, read and comprehend informational texts, including history/social studies, science, and technical texts, at the high end of the grades 4–5 text complexity band independently and proficiently.

1.1.3 Reading Standards: Foundational Skills (K–5)

These standards are directed toward fostering students' understanding and working knowledge of concepts of print, the alphabetic principle, and other basic conventions of the English writing system. These foundational skills are not an end in and of themselves; rather, they are necessary and important components of an effective, comprehensive reading program designed to develop proficient readers with the capacity to comprehend texts across a range of types and disciplines. Instruction should be differentiated: good readers will need much less practice with these concepts than struggling readers will. The point is to teach students what they need to learn and not what they already know—to discern when particular children or activities warrant more or less attention.

Note: In kindergarten, children are expected to demonstrate increasing awareness and competence in the areas that follow.

A. Kindergartners:	B. Grade 1 students:
Print Concepts	
1. Demonstrate understanding of the organization and basic features of print. a. Follow words from left to right, top to bottom, and page by page. b. Recognize that spoken words are represented in written language by specific sequences of letters. c. Understand that words are separated by spaces in print. d. Recognize and name all upper- and lowercase letters of the alphabet.	**1.** Demonstrate understanding of the organization and basic features of print. a. Recognize the distinguishing features of a sentence (e.g., first word, capitalization, ending punctuation).
Phonological Awareness	
2. Demonstrate understanding of spoken words, syllables, and sounds (phonemes). a. Recognize and produce rhyming words. b. Count, pronounce, blend, and segment syllables in spoken words. c. Blend and segment onsets and rimes of single-syllable spoken words. d. Isolate and pronounce the initial, medial vowel, and final sounds (phonemes) in three-phoneme (consonant-vowel-consonant, or CVC) words.* (This does not include CVCs ending with */l/*, */r/*, or */x/*.) e. Add or substitute individual sounds (phonemes) in simple, one-syllable words to make new words.	**2.** Demonstrate understanding of spoken words, syllables, and sounds (phonemes). a. Distinguish long from short vowel sounds in spoken single-syllable words. b. Orally produce single-syllable words by blending sounds (phonemes), including consonant blends. c. Isolate and pronounce initial, medial vowel, and final sounds (phonemes) in spoken single-syllable words. d. Segment spoken single-syllable words into their complete sequence of individual sounds (phonemes).

*Words, syllables, or phonemes written in /slashes/refer to their pronunciation or phonology. Thus, /CVC/ is a word with three phonemes regardless of the number of letters in the spelling of the word.

A, Kindergartners:	B. Grade 1 students:	C. Grade 2 students:

Phonics and Word Recognition

3. Know and apply grade-level phonics and word analysis skills in decoding words.

a. Demonstrate basic knowledge of one-to-one letter-sound correspondences by producing the primary sound or many of the most frequent sounds for each consonant.
b. Associate the long and short sounds with common spellings (graphemes) for the five major vowels.
c. Read common high-frequency words by sight (e.g., *the, of, to, you, she, my, is, are, do, does*).
d. Distinguish between similarly spelled words by identifying the sounds of the letters that differ.

3. Know and apply grade-level phonics and word analysis skills in decoding words.

a. Know the spelling-sound correspondences for common consonant digraphs.
b. Decode regularly spelled one-syllable words.
c. Know final *-e* and common vowel team conventions for representing long vowel sounds.
d. Use knowledge that every syllable must have a vowel sound to determine the number of syllables in a printed word.
e. Decode two-syllable words following basic patterns by breaking the words into syllables.
f. Read words with inflectional endings.
g. Recognize and read grade-appropriate irregularly spelled words.

3. Know and apply grade-level phonics and word analysis skills in decoding words.

a. Distinguish long and short vowels when reading regularly spelled one-syllable words.
b. Know spelling-sound correspondences for additional common vowel teams.
c. Decode regularly spelled two-syllable words with long vowels.
d. Decode words with common prefixes and suffixes.
e. Identify words with inconsistent but common spelling-sound correspondences.
f. Recognize and read grade-appropriate irregularly spelled words.

Fluency

4. Read emergent-reader texts with purpose and understanding.

4. Read with sufficient accuracy and fluency to support comprehension.

a. Read grade-level text with purpose and understanding.
b. Read grade-level text orally with accuracy, appropriate rate, and expression on successive readings.
c. Use context to confirm or self-correct word recognition and understanding, rereading as necessary.

4. Read with sufficient accuracy and fluency to support comprehension.

a. Read grade-level text with purpose and understanding.
b. Read grade-level text orally with accuracy, appropriate rate, and expression on successive readings.
c. Use context to confirm or self-correct word recognition and understanding, rereading as necessary.

D. Grade 3 students:	E. Grade 4 students:	F. Grade 5 students:
Phonics and Word Recognition		
3. Know and apply grade-level phonics and word analysis skills in decoding words. a. Identify and know the meaning of the most common prefixes and derivational suffixes. b. Decode words with common Latin suffixes. c. Decode multisyllable words. d. Read grade-appropriate irregularly spelled words.	**3.** Know and apply grade-level phonics and word analysis skills in decoding words. a. Use combined knowledge of all letter-sound correspondences, syllabication patterns, and morphology (e.g., roots and affixes) to read accurately unfamiliar multisyllabic words in context and out of context.	**3.** Know and apply grade-level phonics and word analysis skills in decoding words. a. Use combined knowledge of all letter-sound correspondences, syllabication patterns, and morphology (e.g., roots and affixes) to read accurately unfamiliar multisyllabic words in context and out of context.
Fluency		
4. Read with sufficient accuracy and fluency to support comprehension. a. Read grade-level text with purpose and understanding. b. Read grade-level prose and poetry orally with accuracy, appropriate rate, and expression on successive readings. c. Use context to confirm or self-correct word recognition and understanding, rereading as necessary.	**4.** Read with sufficient accuracy and fluency to support comprehension. a. Read grade-level text with purpose and understanding. b. Read grade-level prose and poetry orally with accuracy, appropriate rate, and expression on successive readings. c. Use context to confirm or self-correct word recognition and understanding, rereading as necessary.	**4.** Read with sufficient accuracy and fluency to support comprehension. a. Read grade-level text with purpose and understanding. b. Read grade-level prose and poetry orally with accuracy, appropriate rate, and expression on successive readings. c. Use context to confirm or self-correct word recognition and understanding, rereading as necessary.

1.2 College and Career Readiness Anchor Standards for Writing

The K–5 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to the College and Career Readiness (CCR) anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.

Text Types and Purposes*

1.Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

2.Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

3.Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

Production and Distribution of Writing

4.Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

5.Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

6.Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

Research to Build and Present Knowledge

7.Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

8.Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.

9.Draw evidence from literary or informational texts to support analysis, reflection, and research.

Range of Writing

10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

*These broad types of writing include many subgenres. See Appendix A for definitions of key writing types. See Appendix A for definitions of key writing types.
http://www.maine.gov/education/lres/ela/standards.html#appendixA

1.2.1 Writing Standards K–5

The following standards for K–5 offer a focus for instruction each year to help ensure that students gain adequate mastery of a range of skills and applications. Each year in their writing, students should demonstrate increasing sophistication in all aspects of language use, from vocabulary and syntax to the development and organization of ideas, and they should address increasingly demanding content and sources. *Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.* The expected growth in student writing ability is reflected both in the standards themselves and in the collection of annotated student writing samples in Appendix C. http://www.maine.gov/education/lres/ela/standards.html#appendixC

A. Kindergartners:	**B. Grade 1 students:**	**C. Grade 2 students:**
Text Types and Purposes		
1. Use a combination of drawing, dictating, and writing to compose opinion pieces in which they tell a reader the topic or the name of the book they are writing about and state an opinion or preference about the topic or book (e.g., *My favorite book is . . .*).	**1.** Write opinion pieces in which they introduce the topic or name the book they are writing about, state an opinion, supply a reason for the opinion, and provide some sense of closure.	**1.** Write opinion pieces in which they introduce the topic or book they are writing about, state an opinion, supply reasons that support the opinion, use linking words (e.g., *because, and, also*) to connect opinion and reasons, and provide a concluding statement or section.
2. Use a combination of drawing, dictating, and writing to compose informative/explanatory texts in which they name what they are writing about and supply some information about the topic.	**2.** Write informative/explanatory texts in which they name a topic, supply some facts about the topic, and provide some sense of closure.	**2.** Write informative/explanatory texts in which they introduce a topic, use facts and definitions to develop points, and provide a concluding statement or section.
3. Use a combination of drawing, dictating, and writing to narrate a single event or several loosely linked events, tell about the events in the order in which they occurred, and provide a reaction to what happened.	**3.** Write narratives in which they recount two or more appropriately sequenced events, include some details regarding what happened, use temporal words to signal event order, and provide some sense of closure.	**3.** Write narratives in which they recount a well-elaborated event or short sequence of events, include details to describe actions, thoughts, and feelings, use temporal words to signal event order, and provide a sense of closure.
Production and Distribution of Writing		
4. (Begins in grade 3)	**4.** (Begins in grade 3)	**4.** (Begins in grade 3)
5. With guidance and support from adults, respond to questions and suggestions from peers and add details to strengthen writing as needed.	**5.** With guidance and support from adults, focus on a topic, respond to questions and suggestions from peers, and add details to strengthen writing as needed.	**5.** With guidance and support from adults and peers, focus on a topic and strengthen writing as needed by revising and editing.
6. With guidance and support from adults, explore a variety of digital tools to produce and publish writing, including in collaboration with peers.	**6.** With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers.	**6.** With guidance and support from adults, use a variety of digital tools to produce and publish writing, including in collaboration with peers.
Research to Build and Present Knowledge		
7. Participate in shared research and writing projects (e.g., explore a number of books by a favorite author and express opinions about them).	**7.** Participate in shared research and writing projects (e.g., explore a number of "how-to" books on a given topic and use them to write a sequence of instructions).	**7.** Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations).
8. With guidance and support from adults, recall information from experiences or gather information from provided	**8.** With guidance and support from adults, recall information from experiences or gather information from provided	**8.** Recall information from experiences or gather information

sources to answer a question.	sources to answer a question.	from provided sources to answer a question.
9. (Begins in grade 4)	**9.** (Begins in grade 4)	**9.** (Begins in grade 4)
Range of Writing		
10. (Begins in grade 3)	**10.** (Begins in grade 3)	**10.** (Begins in grade 3)

D. Grade 3 students:	E. Grade 4 students:	F. Grade 5 students:
Production and Distribution of Writing		
4. With guidance and support from adults, produce writing in which the development and organization are appropriate to task and purpose. (Grade-specific expectations for writing types are defined in standards 1–3 above.)	**4.** Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)	**4.** Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
5. With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, and editing. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grade 3.)	**5.** With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, and editing. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grade 4.)	**5.** With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grade 5.)
6. With guidance and support from adults, use technology to produce and publish writing (using keyboarding skills) as well as to interact and collaborate with others.	**6.** With some guidance and support from adults, use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others; demonstrate sufficient command of keyboarding skills to type a minimum of one page in a single sitting.	**6.** With some guidance and support from adults, use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others; demonstrate sufficient command of keyboarding skills to type a minimum of two pages in a single sitting.
Research to Build and Present Knowledge		
7. Conduct short research projects that build knowledge about a topic.	**7.** Conduct short research projects that build knowledge through investigation of different aspects of a topic.	**7.** Conduct short research projects that use several sources to build knowledge through investigation of different aspects of a topic.
8. Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.	**8.** Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.	**8.** Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.
9. (Begins in grade 4)	**9.** Draw evidence from literary or informational texts to support analysis, reflection, and research. a. Apply *grade 4 Reading standards* to literature (e.g., "Describe in depth a character, setting, or event in a story or drama, drawing on specific details in the text [e.g., a character's thoughts, words, or actions]."). b. Apply *grade 4 Reading standards* to informational texts (e.g., "Explain how an author uses reasons and evidence to support particular points in a text"). -	**9.** Draw evidence from literary or informational texts to support analysis, reflection, and research. a. Apply *grade 5 Reading standards* to literature (e.g., "Compare and contrast two or more characters, settings, or events in a story or a drama, drawing on specific details in the text [e.g., how characters interact]"). b. Apply *grade 5 Reading standards* to informational texts (e.g., "Explain how an author uses reasons and evidence to support particular points in a text, identifying which reasons and evidence support which

		point[s]").
Range of Writing		
10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.	**10.** Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.	**10.** Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

1.3 College and Career Readiness Anchor Standards for Speaking and Listening

The K–5 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to the College and Career Readiness (CCR) anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.

Comprehension and Collaboration

1.Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

2.Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.

3.Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

Presentation of Knowledge and Ideas

4.Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

5.Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.

6.Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

1.3.1 Speaking and Listening Standards K–5

The following standards for K–5 offer a focus for instruction each year to help ensure that students gain adequate mastery of a range of skills and applications. *Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.*

A. Kindergartners:	**B. Grade 1 students:**	**C. Grade 2 students:**
Comprehension and Collaboration		
1. Participate in collaborative conversations with diverse partners about *kindergarten topics and texts* with peers and adults in small and larger groups. a. Follow agreed-upon rules for discussions (e.g., listening to others and taking turns speaking about the topics and texts under discussion). b. Continue a conversation through multiple exchanges.	**1.** Participate in collaborative conversations with diverse partners about *grade 1 topics and texts* with peers and adults in small and larger groups. a. Follow agreed-upon rules for discussions (e.g., listening to others with care, speaking one at a time about the topics and texts under discussion). b. Build on others' talk in conversations by responding to the comments of others through multiple exchanges. c. Ask questions to clear up any confusion about the topics and texts under discussion.	**1.** Participate in collaborative conversations with diverse partners about *grade 2 topics and texts* with peers and adults in small and larger groups. a. Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion). b. Build on others' talk in conversations by linking their comments to the remarks of others. c. Ask for clarification and further explanation as needed about the topics and texts under discussion.
2. Confirm understanding of a text read aloud or information presented orally or through other media by asking and answering questions about key details and requesting clarification if something is not understood.	**2.** Ask and answer questions about key details in a text read aloud or information presented orally or through other media.	**2.** Recount or describe key ideas or details from a text read aloud or information presented orally or through other media.
3. Ask and answer questions in order to seek help, get information, or clarify something that is not understood.	**3.** Ask and answer questions about what a speaker says in order to gather additional information or clarify something that is not understood.	**3.** Ask and answer questions about what a speaker says in order to clarify comprehension, gather additional information, or deepen understanding of a topic or issue.
Presentation of Knowledge and Ideas		
4. Describe familiar people, places, things, and events and, with prompting and support, provide additional detail.	**4.** Describe people, places, things, and events with relevant details, expressing ideas and feelings clearly.	**4.** Tell a story or recount an experience with appropriate facts and relevant, descriptive details, speaking audibly in coherent sentences.
5. Add drawings or other visual displays to descriptions as desired to provide additional detail.	**5.** Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.	**5.** Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings.
6. Speak audibly and express thoughts, feelings, and ideas clearly.	**6.** Produce complete sentences when appropriate to task and situation. (See grade 1 Language standards 1and 3 for specific expectations.)	**6.** Produce complete sentences when appropriate to task and situation in order to provide requested detail or clarification. (See grade 2 Language standards 1and 3 for specific

		expectations.)
D. Grade 3 students:	**E. Grade 4 students:**	**F. Grade 5 students:**
Comprehension and Collaboration		
1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 3 topics and texts*, building on others' ideas and expressing their own clearly. a. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion. b. Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion). c. Ask questions to check understanding of information presented, stay on topic, and link their comments to the remarks of others. d. Explain their own ideas and understanding in light of the discussion.	**1.** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 4 topics and texts*, building on others' ideas and expressing their own clearly. a. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion. b. Follow agreed-upon rules for discussions and carry out assigned roles. c. Pose and respond to specific questions to clarify or follow up on information, and make comments that contribute to the discussion and link to the remarks of others. d. Review the key ideas expressed and explain their own ideas and understanding in light of the discussion.	**1.** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 5 topics and texts*, building on others' ideas and expressing their own clearly. a. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion. b. Follow agreed-upon rules for discussions and carry out assigned roles. c. Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others. d. Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions.
2. Determine the main ideas and supporting details of a text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.	**2.** Paraphrase portions of a text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.	**2.** Summarize a written text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.
3. Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.	**3.** Identify the reasons and evidence a speaker provides to support particular points.	**3.** Summarize the points a speaker makes and explain how each claim is supported by reasons and evidence.
Presentation of Knowledge and Ideas		
4. Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.	**4.** Report on a topic or text, tell a story, or recount an experience in an organized manner, using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.	**4.** Report on a topic or text or present an opinion, sequencing ideas logically and using appropriate facts and relevant, descriptive details to support main ideas or themes; speak clearly at an understandable pace.
5. Create engaging audio recordings of stories or poems that demonstrate fluid reading at an understandable pace; add visual displays when appropriate to emphasize or enhance	**5.** Add audio recordings and visual displays to presentations when appropriate to enhance the development of main	**5.** Include multimedia components (e.g., graphics, sound) and visual displays in presentations when appropriate to

certain facts or details.	ideas or themes.	enhance the development of main ideas or themes.
6. Speak in complete sentences when appropriate to task and situation in order to provide requested detail or clarification. (See grade 3 Language standards 1 and 3 for specific expectations.)	**6.** Differentiate between contexts that call for formal English (e.g., presenting ideas) and situations where informal discourse is appropriate (e.g., small-group discussion); use formal English when appropriate to task and situation. (See grade 4 Language standards 1 and 3 for specific expectations.)	**6.** Adapt speech to a variety of contexts and tasks, using formal English when appropriate to task and situation. (See grade 5 Language standards 1 and 3 for specific expectations.)

1.4 College and Career Readiness Anchor Standards for Language

The K–5 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to the College and Career Readiness (CCR) anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.

Conventions of Standard English

1.Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

2.Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

Knowledge of Language

3.Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

Vocabulary Acquisition and Use

4.Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.

5.Demonstrate understanding of figurative language, word relationships and nuances in word meanings.

6.Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when encountering an unknown term important to comprehension or expression.

1.4.1 Language Standards K–5

The following standards for grades K–5 offer a focus for instruction each year to help ensure that students gain adequate mastery of a range of skills and applications. *Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.* Beginning in grade 3, skills and understandings that are particularly likely to require continued attention in higher grades as they are applied to increasingly sophisticated writing and speaking are marked with an asterisk (*). See the table on page 31 for a complete list and Appendix A for an example of how these skills develop in sophistication.

A. Kindergartners:	B. Grade 1 students:	C. Grade 2 students:
Conventions of Standard English		
1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. a. Print many upper- and lowercase letters. b. Use frequently occurring nouns and verbs. c. Form regular plural nouns orally by adding /s/ or /es/ (e.g., *dog*, *dogs*; *wish*, *wishes*). d. Understand and use question words (interrogatives) (e.g., *who*, *what*, *where*, *when*, *why*, *how*). e. Use the most frequently occurring prepositions (e.g., *to*, *from*, *in*, *out*, *on*, *off*, *for*, *of*, *by*, *with*). f. Produce and expand complete sentences in shared language activities.	**1.** Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. a. Print all upper- and lowercase letters. b. Use common, proper, and possessive nouns. c. Use singular and plural nouns with matching verbs in basic sentences (e.g., *He hops*; *We hop*). d. Use personal, possessive, and indefinite pronouns (e.g., *I*, *me*, *my*; *they*, *them*, *their*; *anyone*, *everything*). e. Use verbs to convey a sense of past, present, and future (e.g., *Yesterday I walked home*; *Today I walk home*; *Tomorrow I will walk home*). f. Use frequently occurring adjectives. g. Use frequently occurring conjunctions (e.g., *and*, *but*, *or*, *so*, *because*). h. Use determiners (e.g., articles, demonstratives). i. Use frequently occurring prepositions (e.g., *during*, *beyond*, *toward*). j. Produce and expand complete simple and compound declarative, interrogative, imperative, and exclamatory sentences in response to prompts.	**1.** Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. a. Use collective nouns (e.g., *group*). b. Form and use frequently occurring irregular plural nouns (e.g., *feet*, *children*, *teeth*, *mice*, *fish*). c. Use reflexive pronouns (e.g., *myself*, *ourselves*). d. Form and use the past tense of frequently occurring irregular verbs (e.g., *sat*, *hid*, *told*). e. Use adjectives and adverbs, and choose between them depending on what is to be modified. f. Produce, expand, and rearrange complete simple and compound sentences (e.g., *The boy watched the movie*; *The little boy watched the movie*; *The action movie was watched by the little boy*).
2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when	**2.** Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when	**2.** Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

writing. a. Capitalize the first word in a sentence and the pronoun *I*. b. Recognize and name end punctuation. c. Write a letter or letters for most consonant and short-vowel sounds (phonemes). d. Spell simple words phonetically, drawing on knowledge of sound-letter relationships.	writing. a. Capitalize dates and names of people. b. Use end punctuation for sentences. c. Use commas in dates and to separate single words in a series. d. Use conventional spelling for words with common spelling patterns and for frequently occurring irregular words. e. Spell untaught words phonetically, drawing on phonemic awareness and spelling conventions.	a. Capitalize holidays, product names, and geographic names. b. Use commas in greetings and closings of letters. c. Use an apostrophe to form contractions and frequently occurring possessives. d. Generalize learned spelling patterns when writing words (e.g., *cage* → *badge*; *boy* → *boil*). e. Consult reference materials, including beginning dictionaries, as needed to check and correct spellings.
Knowledge of Language		
3. (Begins in grade 2)	**3.** (Begins in grade 2)	**3.** Use knowledge of language and its conventions when writing, speaking, reading, or listening. a. Compare formal and informal uses of English.

A. Kindergartners:	**B. Grade 1 students:**	**C. Grade 2 students:**
Vocabulary Acquisition and Use		
4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *kindergarten reading and content*. a. Identify new meanings for familiar words and apply them accurately (e.g., knowing *duck* is a bird and learning the verb *to duck*). b. Use the most frequently occurring inflections and affixes (e.g., *-ed*, *-s*, *re-*, *un-*, *pre-*, *-ful*, *-less*) as a clue to the meaning of an unknown word.	**4.** Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grade 1 reading and content*, choosing flexibly from an array of strategies. a. Use sentence-level context as a clue to the meaning of a word or phrase. b. Use frequently occurring affixes as a clue to the meaning of a word. c. Identify frequently occurring root words (e.g., *look*) and their inflectional forms (e.g., *looks*, *looked*, *looking*).	**4.** Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grade 2 reading and content*, choosing flexibly from an array of strategies. a. Use sentence-level context as a clue to the meaning of a word or phrase. b. Determine the meaning of the new word formed when a known prefix is added to a known word (e.g., *happy/unhappy*, *tell/retell*). c. Use a known root word as a clue to the meaning of an unknown word with the same root (e.g., *addition*, *additional*). d. Use knowledge of the meaning of individual words to predict the meaning of compound words (e.g., *birdhouse*, *lighthouse*, *housefly*; *bookshelf*, *notebook*, *bookmark*). e. Use glossaries and beginning dictionaries, both print and digital, to determine or clarify the meaning of words and phrases.
5. With guidance and support from adults, explore word relationships and nuances in word meanings.	**5.** With guidance and support from adults, demonstrate understanding of word relationships and nuances in word	**5.** Demonstrate understanding of word relationships and nuances in word meanings.

a. Sort common objects into categories (e.g., shapes, foods) to gain a sense of the concepts the categories represent. b. Demonstrate understanding of frequently occurring verbs and adjectives by relating them to their opposites (antonyms). c. Identify real-life connections between words and their use (e.g., note places at school that are *colorful*). d. Distinguish shades of meaning among verbs describing the same general action (e.g., *walk, march, strut, prance*) by acting out the meanings.	meanings. a. Sort words into categories (e.g., colors, clothing) to gain a sense of the concepts the categories represent. b. Define words by category and by one or more key attributes (e.g., a *duck* is a bird that swims; a *tiger* is a large cat with stripes). c. Identify real-life connections between words and their use (e.g., note places at home that are *cozy*). d. Distinguish shades of meaning among verbs differing in manner (e.g., *look, peek, glance, stare, glare, scowl*) and adjectives differing in intensity (e.g., *large, gigantic*) by defining or choosing them or by acting out the meanings.	a. Identify real-life connections between words and their use (e.g., describe foods that are *spicy* or *juicy*). b. Distinguish shades of meaning among closely related verbs (e.g., *toss, throw, hurl*) and closely related adjectives (e.g., *thin, slender, skinny, scrawny*).
6. Use words and phrases acquired through conversations, reading and being read to, and responding to texts.	**6.** Use words and phrases acquired through conversations, reading and being read to, and responding to texts, including using frequently occurring conjunctions to signal simple relationships (e.g., *because*).	**6.** Use words and phrases acquired through conversations, reading and being read to, and responding to texts, including using adjectives and adverbs to describe (e.g., *When other kids are happy that makes me happy*).

D. Grade 3 students:	**E. Grade 4 students:**	**F. Grade 5 students:**
Conventions of Standard English		

1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. a. Explain the function of nouns, pronouns, verbs, adjectives, and adverbs in general and their functions in particular sentences. b. Form and use regular and irregular plural nouns. c. Use abstract nouns (e.g., *childhood*). d. Form and use regular and irregular verbs. e. Form and use the simple (e.g., *I walked*; *I walk*; *I will walk*) verb tenses. f. Ensure subject-verb and pronoun-antecedent agreement.* g. Form and use comparative and superlative adjectives and adverbs, and choose between them depending on what is to be modified. h. Use coordinating and subordinating conjunctions. i. Produce simple, compound, and complex sentences.	**1.** Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. a. Use relative pronouns (*who, whose, whom, which, that*) and relative adverbs (*where, when, why*). b. Form and use the progressive (e.g., *I was walking*; *I am walking*; *I will be walking*) verb tenses. c. Use modal auxiliaries (e.g., *can, may, must*) to convey various conditions. d. Order adjectives within sentences according to conventional patterns (e.g., *a small red bag* rather than *a red small bag*). e. Form and use prepositional phrases. f. Produce complete sentences, recognizing and correcting inappropriate fragments and run-ons.* g. Correctly use frequently confused words (e.g., *to, too, two*; *there, their*).*	**1.** Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. a. Explain the function of conjunctions, prepositions, and interjections in general and their function in particular sentences. b. Form and use the perfect (e.g., *I had walked*; *I have walked*; *I will have walked*) verb tenses. c. Use verb tense to convey various times, sequences, states, and conditions. d. Recognize and correct inappropriate shifts in verb tense.* e. Use correlative conjunctions (e.g., either/or, neither/nor).
2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. a. Capitalize appropriate words in titles. b. Use commas in addresses. c. Use commas and quotation marks in dialogue. d. Form and use possessives. e. Use conventional spelling for high-frequency and other studied words and for adding suffixes to base words (e.g., *sitting, smiled, cries, happiness*). f. Use spelling patterns and generalizations (e.g., word families, position-based spellings, syllable patterns, ending rules, meaningful word parts) in writing words. g. Consult reference materials, including beginning dictionaries, as needed to check and correct spellings.	**2.** Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. a. Use correct capitalization. b. Use commas and quotation marks to mark direct speech and quotations from a text. c. Use a comma before a coordinating conjunction in a compound sentence. d. Spell grade-appropriate words correctly, consulting references as needed.	**2.** Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. a. Use punctuation to separate items in a series.* b. Use a comma to separate an introductory element from the rest of the sentence. c. Use a comma to set off the words *yes* and *no* (e.g., *Yes, thank you*), to set off a tag question from the rest of the sentence (e.g., *It's true, isn't it?*), and to indicate direct address (e.g., *Is that you, Steve?*). d. Use underlining, quotation marks, or italics to indicate titles of works. e. Spell grade-appropriate words correctly, consulting references as needed.
Knowledge of Language		
3. Use knowledge of language and its conventions when writing, speaking, reading, or listening. a. Choose words and phrases for effect.*	**3.** Use knowledge of language and its conventions when writing, speaking, reading, or listening. a. Choose words and phrases to convey ideas precisely.* b. Choose punctuation for effect.* c. Differentiate between contexts that call for formal	**3.** Use knowledge of language and its conventions when writing, speaking, reading, or listening. a. Expand, combine, and reduce sentences for meaning, reader/listener interest, and style. b. Compare and contrast the varieties of English (e.g.,

b. Recognize and observe differences between the conventions of spoken and written standard English.	English (e.g., presenting ideas) and situations where informal discourse is appropriate (e.g., small-group discussion).	dialects, registers) used in stories, dramas, or poems.

D. Grade 3 students:	**E. Grade 4 students:**	**F. Grade 5 students:**
Vocabulary Acquisition and Use		
4. Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on *grade 3 reading and content*, choosing flexibly from a range of strategies. a. Use sentence-level context as a clue to the meaning of a word or phrase. b. Determine the meaning of the new word formed when a known affix is added to a known word (e.g., *agreeable/disagreeable, comfortable/uncomfortable, care/careless, heat/preheat*). c. Use a known root word as a clue to the meaning of an unknown word with the same root (e.g., *company, companion*). d. Use glossaries or beginning dictionaries, both print and digital, to determine or clarify the precise meaning of key words and phrases.	**4.** Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grade 4 reading and content*, choosing flexibly from a range of strategies. a. Use context (e.g., definitions, examples, or restatements in text) as a clue to the meaning of a word or phrase. b. Use common, grade-appropriate Greek and Latin affixes and roots as clues to the meaning of a word (e.g., *telegraph, photograph, autograph*). c. Consult reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation and determine or clarify the precise meaning of key words and phrases.	**4.** Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grade 5 reading and content*, choosing flexibly from a range of strategies. a. Use context (e.g., cause/effect relationships and comparisons in text) as a clue to the meaning of a word or phrase. b. Use common, grade-appropriate Greek and Latin affixes and roots as clues to the meaning of a word (e.g., *photograph, photosynthesis*). c. Consult reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation and determine or clarify the precise meaning of key words and phrases.
5. Demonstrate understanding of word relationships and nuances in word meanings. a. Distinguish the literal and nonliteral meanings of words and phrases in context (e.g., *take steps*). b. Identify real-life connections between words and their use (e.g., describe people who are *friendly* or *helpful*). c. Distinguish shades of meaning among related words that describe states of mind or degrees of certainty (e.g., *knew, believed, suspected, heard, wondered*).	**5.** Demonstrate understanding of figurative language, word relationships, and nuances in word meanings. a. Explain the meaning of simple similes and metaphors (e.g., *as pretty as a picture*) in context. b. Recognize and explain the meaning of common idioms, adages, and proverbs. c. Demonstrate understanding of words by relating them to their opposites (antonyms) and to words with similar but not identical meanings (synonyms).	**5.** Demonstrate understanding of figurative language, word relationships, and nuances in word meanings. a. Interpret figurative language, including similes and metaphors, in context. b. Recognize and explain the meaning of common idioms, adages, and proverbs. c. Use the relationship between particular words (e.g., synonyms, antonyms, homographs) to better understand each of the words.
6. Acquire and use accurately grade-appropriate conversational, general academic, and domain-specific words and phrases, including those that signal spatial and temporal relationships (e.g., *After dinner that night we went looking for them*).	**6.** Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases, including those that signal precise actions, emotions, or states of being (e.g., *quizzed, whined, stammered*) and that are basic to a particular topic (e.g., *wildlife, conservation*, and *endangered* when discussing animal	**6.** Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases, including those that signal contrast, addition, and other logical relationships (e.g., *however, although, nevertheless, similarly, moreover, in addition*).

preservation).

2. Standards for English Language Arts 6-12

2.1 College and Career Readiness Anchor Standards for Reading

The grades 6–12 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to the College and Career Readiness (CCR) anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.

Key Ideas and Details

1.Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

2.Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

3.Analyze how and why individuals, events, and ideas develop and interact over the course of a text.

Craft and Structure

4.Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

5.Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

6.Assess how point of view or purpose shapes the content and style of a text.

Integration of Knowledge and Ideas

7.Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.*

8.Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.

9.Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

Range of Reading and Level of Text Complexity

10. Read and comprehend complex literary and informational texts independently and proficiently.

*Please see "Research to Build Knowledge" in Writing and "Comprehension and Collaboration" in Speaking and Listening for additional standards relevant to gathering, assessing, and applying information from print and digital sources.

2.1.1 Reading Standards for Literature 6–12

The following standards offer a focus for instruction each year and help ensure that students gain adequate exposure to a range of texts and tasks. Rigor is also infused through the requirement that students read increasingly complex texts through the grades. *Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.*

A. Grade 6 students:	**B. Grade 7 students:**	**C. Grade 8 students:**
Key Ideas and Details		
1. Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.	**1.** Cite several pieces of textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.	**1.** Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.
2. Determine a theme or central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.	**2.** Determine a theme or central idea of a text and analyze its development over the course of the text; provide an objective summary of the text.	**2.** Determine a theme or central idea of a text and analyze its development over the course of the text, including its relationship to the characters, setting, and plot; provide an objective summary of the text.
3. Describe how a particular story's or drama's plot unfolds in a series of episodes as well as how the characters respond or change as the plot moves toward a resolution.	**3.** Analyze how particular elements of a story or drama interact (e.g., how setting shapes the characters or plot).	**3.** Analyze how particular lines of dialogue or incidents in a story or drama propel the action, reveal aspects of a character, or provoke a decision.
Craft and Structure		
4. Determine the meaning of words and phrases as they are used in a text, including figurative and connotative meanings; analyze the impact of a specific word choice on meaning and tone.	**4.** Determine the meaning of words and phrases as they are used in a text, including figurative and connotative meanings; analyze the impact of rhymes and other repetitions of sounds (e.g., alliteration) on a specific verse or stanza of a poem or section of a story or drama.	**4.** Determine the meaning of words and phrases as they are used in a text, including figurative and connotative meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts.
5. Analyze how a particular sentence, chapter, scene, or stanza fits into the overall structure of a text and contributes to the development of the theme, setting, or plot.	**5.** Analyze how a drama's or poem's form or structure (e.g., soliloquy, sonnet) contributes to its meaning.	**5.** Compare and contrast the structure of two or more texts and analyze how the differing structure of each text contributes to its meaning and style.
6. Explain how an author develops the point of view of the narrator or speaker in a text.	**6.** Analyze how an author develops and contrasts the points of view of different characters or narrators in a text.	**6.** Analyze how differences in the points of view of the characters and the audience or reader (e.g., created through the use of dramatic irony) create such effects as suspense or humor.
Integration of Knowledge and Ideas		
7. Compare and contrast the experience of reading a story, drama, or poem to listening to or viewing an audio, video, or live version of the text, including contrasting what they "see" and "hear" when reading the text to what they perceive when they listen or watch.	**7.** Compare and contrast a written story, drama, or poem to its audio, filmed, staged, or multimedia version, analyzing the effects of techniques unique to each medium (e.g., lighting, sound, color, or camera focus and angles in a film).	**7.** Analyze the extent to which a filmed or live production of a story or drama stays faithful to or departs from the text or script, evaluating the choices made by the director or actors.

A. Grade 6 students:	B. Grade 7 students:	C. Grade 8 students:
8. (Not applicable to literature)	**8.** (Not applicable to literature)	**8.** (Not applicable to literature)

A. Grade 6 students:	B. Grade 7 students:	C. Grade 8 students:
Integration of Knowledge and Ideas		
9. Compare and contrast texts in different forms or genres (e.g., stories and poems; historical novels and fantasy stories) in terms of their approaches to similar themes and topics.	**9.** Compare and contrast a fictional portrayal of a time, place, or character and a historical account of the same period as a means of understanding how authors of fiction use or alter history.	**9.** Analyze how a modern work of fiction draws on themes, patterns of events, or character types from myths, traditional stories, or religious works such as the Bible, including describing how the material is rendered new.
Range of Reading and Level of Text Complexity		
10. By the end of the year, read and comprehend literature, including stories, dramas, and poems, in the grades 6–8 text complexity band proficiently, with scaffolding as needed at the high end of the range.	**10.** By the end of the year, read and comprehend literature, including stories, dramas, and poems, in the grades 6–8 text complexity band proficiently, with scaffolding as needed at the high end of the range.	**10.** By the end of the year, read and comprehend literature, including stories, dramas, and poems, at the high end of grades 6–8 text complexity band independently and proficiently.

The CCR anchor standards and high school grade-specific standards work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.

D. Grades 9–10 students:	**E. Grades 11–12 students:**
Key Ideas and Details	
1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.	**1.** Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.
2. Determine a theme or central idea of a text and analyze in detail its development over the course of the text, including how it emerges and is shaped and refined by specific details; provide an objective summary of the text.	**2.** Determine two or more themes or central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to produce a complex account; provide an objective summary of the text.
3. Analyze how complex characters (e.g., those with multiple or conflicting motivations) develop over the course of a text, interact with other characters, and advance the plot or develop the theme.	**3.** Analyze the impact of the author's choices regarding how to develop and relate elements of a story or drama (e.g., where a story is set, how the action is ordered, how the characters are introduced and developed).
Craft and Structure	
4. Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language evokes a sense of time and place; how it sets a formal or informal tone).	**4.** Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the impact of specific word choices on meaning and tone, including words with multiple meanings or language that is particularly fresh, engaging, or beautiful. (Include Shakespeare as well as other authors.)
5. Analyze how an author's choices concerning how to structure a text, order events within it (e.g., parallel plots), and manipulate time (e.g., pacing, flashbacks) create such effects as mystery, tension, or surprise.	**5.** Analyze how an author's choices concerning how to structure specific parts of a text (e.g., the choice of where to begin or end a story, the choice to provide a comedic or tragic resolution) contribute to its overall structure and meaning as well as its aesthetic impact.
6. Analyze a particular point of view or cultural experience reflected in a work of literature from outside the United States, drawing on a wide reading of world literature.	**6.** Analyze a case in which grasping point of view requires distinguishing what is directly stated in a text from what is really meant (e.g., satire, sarcasm, irony, or understatement).
Integration of Knowledge and Ideas	
7. Analyze the representation of a subject or a key scene in two different artistic mediums,	**7.** Analyze multiple interpretations of a story, drama, or poem (e.g., recorded or live production of a

D. Grades 9–10 students:	E. Grades 11–12 students:
including what is emphasized or absent in each treatment (e.g., Auden's "Musée des Beaux Arts" and Breughel's *Landscape with the Fall of Icarus*).	play or recorded novel or poetry), evaluating how each version interprets the source text. (Include at least one play by Shakespeare and one play by an American dramatist.)
8. (Not applicable to literature)	**8.** (Not applicable to literature)
9. Analyze how an author draws on and transforms source material in a specific work (e.g., how Shakespeare treats a theme or topic from Ovid or the Bible or how a later author draws on a play by Shakespeare).	**9.** Demonstrate knowledge of eighteenth-, nineteenth- and early-twentieth-century foundational works of American literature, including how two or more texts from the same period treat similar themes or topics.
Range of Reading and Level of Text Complexity	
10. By the end of grade 9, read and comprehend literature, including stories, dramas, and poems, in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 10, read and comprehend literature, including stories, dramas, and poems, at the high end of the grades 9–10 text complexity band independently and proficiently.	**10.** By the end of grade 11, read and comprehend literature, including stories, dramas, and poems, in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 12, read and comprehend literature, including stories, dramas, and poems, at the high end of the grades 11–CCR text complexity band independently and proficiently.

2.1.2 Reading Standards for Informational Text 6–12

A. Grade 6 students:	B. Grade 7 students:	C. Grade 8 students:
Key Ideas and Details		
1. Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.	**1.** Cite several pieces of textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.	**1.** Cite the textual evidence that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.
2. Determine a central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.	**2.** Determine two or more central ideas in a text and analyze their development over the course of the text; provide an objective summary of the text.	**2.** Determine a central idea of a text and analyze its development over the course of the text, including its relationship to supporting ideas; provide an objective summary of the text.
3. Analyze in detail how a key individual, event, or idea is introduced, illustrated, and elaborated in a text (e.g., through examples or anecdotes).	**3.** Analyze the interactions between individuals, events, and ideas in a text (e.g., how ideas influence individuals or events, or how individuals influence ideas or events).	**3.** Analyze how a text makes connections among and distinctions between individuals, ideas, or events (e.g., through comparisons, analogies, or categories).
Craft and Structure		

4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.	4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of a specific word choice on meaning and tone.	4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of specific word choices on meaning and tone, including analogies or allusions to other texts.
5. Analyze how a particular sentence, paragraph, chapter, or section fits into the overall structure of a text and contributes to the development of the ideas.	5. Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to the development of the ideas.	**5.** Analyze in detail the structure of a specific paragraph in a text, including the role of particular sentences in developing and refining a key concept.
6. Determine an author's point of view or purpose in a text and explain how it is conveyed in the text.	6. Determine an author's point of view or purpose in a text and analyze how the author distinguishes his or her position from that of others.	**6.** Determine an author's point of view or purpose in a text and analyze how the author acknowledges and responds to conflicting evidence or viewpoints.
Integration of Knowledge and Ideas		
7. Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.	**7.** Compare and contrast a text to an audio, video, or multimedia version of the text, analyzing each medium's portrayal of the subject (e.g., how the delivery of a speech affects the impact of the words).	**7.** Evaluate the advantages and disadvantages of using different mediums (e.g., print or digital text, video, multimedia) to present a particular topic or idea.
8. Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not.	**8.** Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims.	**8.** Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient; recognize when irrelevant evidence is introduced.
9. Compare and contrast one author's presentation of events with that of another (e.g., a memoir written by and a biography on the same person).	**9.** Analyze how two or more authors writing about the same topic shape their presentations of key information by emphasizing different evidence or advancing different interpretations of facts.	**9.** Analyze a case in which two or more texts provide conflicting information on the same topic and identify where the texts disagree on matters of fact or interpretation.

A. Grade 6 students:	**B. Grade 7 students:**	**C. Grade 8 students:**
Range of Reading and Level of Text Complexity		
10. By the end of the year, read and comprehend literary nonfiction in the grades 6–8 text complexity band proficiently, with scaffolding as needed at the high end of	**10.** By the end of the year, read and comprehend literary nonfiction in the grades 6–8 text complexity band proficiently, with scaffolding as needed at the high end of	**10.** By the end of the year, read and comprehend literary nonfiction at the high end of the grades 6–8 text complexity band independently and proficiently.

the range.	the range.

The CCR anchor standards and high school grade-specific standards work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.

D. Grades 9–10 students:	**E. Grades 11–12 students:**
Key Ideas and Details	

1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.	**1.** Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.
2. Determine a central idea of a text and analyze its development over the course of the text, including how it emerges and is shaped and refined by specific details; provide an objective summary of the text.	**2.** Determine two or more central ideas of a text and analyze their development over the course of the text, including how they interact and build on one another to provide a complex analysis; provide an objective summary of the text.
3. Analyze how the author unfolds an analysis or series of ideas or events, including the order in which the points are made, how they are introduced and developed, and the connections that are drawn between them.	**3.** Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text.
Craft and Structure	
4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language of a court opinion differs from that of a newspaper).	**4.** Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines *faction* in *Federalist* No. 10).
5. Analyze in detail how an author's ideas or claims are developed and refined by particular sentences, paragraphs, or larger portions of a text (e.g., a section or chapter).	**5.** Analyze and evaluate the effectiveness of the structure an author uses in his or her exposition or argument, including whether the structure makes points clear, convincing, and engaging.
6. Determine an author's point of view or purpose in a text and analyze how an author uses rhetoric to advance that point of view or purpose.	**6.** Determine an author's point of view or purpose in a text in which the rhetoric is particularly effective, analyzing how style and content contribute to the power, persuasiveness, or beauty of the text.
Integration of Knowledge and Ideas	
7. Analyze various accounts of a subject told in different mediums (e.g., a person's life story in both print and multimedia), determining which details are emphasized in each account.	**7.** Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.
8. Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and fallacious reasoning.	**8.** Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning (e.g., in U.S. Supreme Court majority opinions and dissents) and the premises, purposes, and arguments in works of public advocacy (e.g., *The Federalist*, presidential addresses).
9. Analyze seminal U.S. documents of historical and literary significance (e.g., Washington's Farewell Address, the Gettysburg Address, Roosevelt's Four Freedoms speech, King's "Letter from Birmingham Jail"), including how they address related themes and concepts.	**9.** Analyze seventeenth-, eighteenth-, and nineteenth-century foundational U.S. documents of historical and literary significance (including The Declaration of Independence, the Preamble to the Constitution, the Bill of Rights, and Lincoln's Second Inaugural Address) for their themes, purposes, and rhetorical features.
Range of Reading and Level of Text Complexity	
10. By the end of grade 9, read and comprehend literary nonfiction in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 10, read and comprehend literary nonfiction at the high end of the grades 9–10 text complexity band independently and proficiently.	**10.** By the end of grade 11, read and comprehend literary nonfiction in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range. By the end of grade 12, read and comprehend literary nonfiction at the high end of the grades 11–CCR text complexity band independently and proficiently.

2.2 College and Career Readiness Anchor Standards for Writing

The grades 6–12 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to the College and Career Readiness (CCR) anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.

Text Types and Purposes*

1.Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

2.Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

3.Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.

Production and Distribution of Writing

4.Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

5.Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

6.Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

Research to Build and Present Knowledge

7.Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

8.Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.

9.Draw evidence from literary or informational texts to support analysis, reflection, and research.

Range of Writing

10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

*These broad types of writing include many subgenres. See Appendix A for definitions of key writing types.

2.2.1 Writing Standards 6–12

The following standards for grades 6–12 offer a focus for instruction each year to help ensure that students gain adequate mastery of a range of skills and applications. Each year in their writing, students should demonstrate increasing sophistication in all aspects of language use, from vocabulary and syntax to the development and organization of ideas, and they should address increasingly demanding content and sources. *Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.* The expected growth in student writing ability is reflected both in the standards themselves and in the collection of annotated student writing samples in Appendix C. http://www.maine.gov/education/lres/ela/standards.html#appendixC

A. Grade 6 students:	**B. Grade 7 students:**	**C. Grade 8 students:**
Text Types and Purposes		
1. Write arguments to support claims with clear reasons and relevant evidence. a. Introduce claim(s) and organize the reasons and evidence clearly. b. Support claim(s) with clear reasons and relevant evidence, using credible sources and demonstrating an understanding of the topic or text. c. Use words, phrases, and clauses to clarify the relationships among claim(s) and reasons. d. Establish and maintain a formal style. e. Provide a concluding statement or section that follows from the argument presented.	**1.** Write arguments to support claims with clear reasons and relevant evidence. a. Introduce claim(s), acknowledge alternate or opposing claims, and organize the reasons and evidence logically. b. Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text. c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), reasons, and evidence. d. Establish and maintain a formal style. e. Provide a concluding statement or section that follows from and supports the argument presented.	**1.** Write arguments to support claims with clear reasons and relevant evidence. a. Introduce claim(s), acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. b. Support claim(s) with logical reasoning and relevant evidence, using accurate, credible sources and demonstrating an understanding of the topic or text. c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence. d. Establish and maintain a formal style. e. Provide a concluding statement or section that follows from and supports the argument presented.
2. Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. a. Introduce a topic; organize ideas, concepts, and information, using strategies such as definition, classification, comparison/contrast, and cause/effect; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. b. Develop the topic with relevant facts, definitions, concrete details, quotations, or other information and examples. c. Use appropriate transitions to clarify the relationships among ideas and concepts.	**2.** Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information, using strategies such as definition, classification, comparison/contrast, and cause/effect; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. b. Develop the topic with relevant facts, definitions, concrete details, quotations, or other information and examples. c. Use appropriate transitions to create cohesion and	**2.** Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. d. Use precise language and domain-specific vocabulary to

A. Grade 6 students:	B. Grade 7 students:	C. Grade 8 students:
d. Use precise language and domain-specific vocabulary to inform about or explain the topic. e. Establish and maintain a formal style. f. Provide a concluding statement or section that follows from the information or explanation presented.	clarify the relationships among ideas and concepts. d. Use precise language and domain-specific vocabulary to inform about or explain the topic. e. Establish and maintain a formal style. f. Provide a concluding statement or section that follows from and supports the information or explanation presented.	inform about or explain the topic. e. Establish and maintain a formal style. f. Provide a concluding statement or section that follows from and supports the information or explanation presented.

A. Grade 6 students:	B. Grade 7 students:	C. Grade 8 students:
Text Types and Purposes (continued)		
3. Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences. a. Engage and orient the reader by establishing a context and introducing a narrator and/or characters; organize an event sequence that unfolds naturally and logically. b. Use narrative techniques, such as dialogue, pacing, and description, to develop experiences, events, and/or characters. c. Use a variety of transition words, phrases, and clauses to convey sequence and signal shifts from one time frame or setting to another. d. Use precise words and phrases, relevant descriptive details, and sensory language to convey experiences and events. e. Provide a conclusion that follows from the narrated experiences or events.	3. Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences. a. Engage and orient the reader by establishing a context and point of view and introducing a narrator and/or characters; organize an event sequence that unfolds naturally and logically. b. Use narrative techniques, such as dialogue, pacing, and description, to develop experiences, events, and/or characters. c. Use a variety of transition words, phrases, and clauses to convey sequence and signal shifts from one time frame or setting to another. d. Use precise words and phrases, relevant descriptive details, and sensory language to capture the action and convey experiences and events. e. Provide a conclusion that follows from and reflects on the narrated experiences or events.	3. Write narratives to develop real or imagined experiences or events using effective technique, relevant descriptive details, and well-structured event sequences. a. Engage and orient the reader by establishing a context and point of view and introducing a narrator and/or characters; organize an event sequence that unfolds naturally and logically. b. Use narrative techniques, such as dialogue, pacing, description, and reflection, to develop experiences, events, and/or characters. c. Use a variety of transition words, phrases, and clauses to convey sequence, signal shifts from one time frame or setting to another, and show the relationships among experiences and events. d. Use precise words and phrases, relevant descriptive details, and sensory language to capture the action and convey experiences and events. e. Provide a conclusion that follows from and reflects on the narrated experiences or events.
Production and Distribution of Writing		
4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)	4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)	4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)

A. Grade 6 students:	B. Grade 7 students:	C. Grade 8 students:
5. With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grade 6.)	5. With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grade 7.)	5. With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grade 8.)
6. Use technology, including the Internet, to produce and publish writing as well as to interact and collaborate with others; demonstrate sufficient command of keyboarding skills to type a minimum of three pages in a single sitting.	6. Use technology, including the Internet, to produce and publish writing and link to and cite sources as well as to interact and collaborate with others, including linking to and citing sources.	6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas efficiently as well as to interact and collaborate with others.

A. Grade 6 students:	B. Grade 7 students:	C. Grade 8 students:
Research to Build and Present Knowledge		
7. Conduct short research projects to answer a question, drawing on several sources and refocusing the inquiry when appropriate.	7. Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.	7. Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
8. Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources.	8. Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.	8. Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
9. Draw evidence from literary or informational texts to support analysis, reflection, and research. a. Apply *grade 6 Reading standards* to literature (e.g., "Compare and contrast texts in different forms or genres [e.g., stories and poems; historical novels and fantasy stories] in terms of their approaches to similar themes and topics"). b. Apply *grade 6 Reading standards* to literary nonfiction (e.g., "Trace and evaluate the argument and specific claims in a text, distinguishing claims that are	9. Draw evidence from literary or informational texts to support analysis, reflection, and research. a. Apply *grade 7 Reading standards* to literature (e.g., "Compare and contrast a fictional portrayal of a time, place, or character and a historical account of the same period as a means of understanding how authors of fiction use or alter history"). b. Apply *grade 7 Reading standards* to literary nonfiction (e.g. "Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is	9. Draw evidence from literary or informational texts to support analysis, reflection, and research. a. Apply *grade 8 Reading standards* to literature (e.g., "Analyze how a modern work of fiction draws on themes, patterns of events, or character types from myths, traditional stories, or religious works such as the Bible, including describing how the material is rendered new"). b. Apply *grade 8 Reading standards* to literary nonfiction (e.g., "Delineate and evaluate the argument and

supported by reasons and evidence from claims that are not").	sound and the evidence is relevant and sufficient to support the claims").	specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient; recognize when irrelevant evidence is introduced").
Range of Writing		
10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.	**10.** Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.	**10.** Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

The CCR anchor standards and high school grade-specific standards work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.

D. Grades 9–10 students:	**E. Grades 11–12 students:**
Text Types and Purposes	
1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly, supplying evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the audience's knowledge level and concerns. c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from and supports the argument presented.	**1.** Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence. a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the audience's knowledge level, concerns, values, and possible biases. c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from and supports the argument presented.

D. Grades 9–10 students:	E. Grades 11–12 students:
2. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content. a. Introduce a topic; organize complex ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. c. Use appropriate and varied transitions to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. d. Use precise language and domain-specific vocabulary to manage the complexity of the topic. e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).	**2.** Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content. a. Introduce a topic; organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. c. Use appropriate and varied transitions and syntax to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. d. Use precise language, domain-specific vocabulary, and techniques such as metaphor, simile, and analogy to manage the complexity of the topic. e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

D. Grades 9–10 students:	E. Grades 11–12 students:
Text Types and Purposes (continued)	

3. Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences. a. Engage and orient the reader by setting out a problem, situation, or observation, establishing one or multiple point(s) of view, and introducing a narrator and/or characters; create a smooth progression of experiences or events. b. Use narrative techniques, such as dialogue, pacing, description, reflection, and multiple plot lines, to develop experiences, events, and/or characters. c. Use a variety of techniques to sequence events so that they build on one another to create a coherent whole. d. Use precise words and phrases, telling details, and sensory language to convey a vivid picture of the experiences, events, setting, and/or characters. e. Provide a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative.	**3.** Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences. a. Engage and orient the reader by setting out a problem, situation, or observation and its significance, establishing one or multiple point(s) of view, and introducing a narrator and/or characters; create a smooth progression of experiences or events. b. Use narrative techniques, such as dialogue, pacing, description, reflection, and multiple plot lines, to develop experiences, events, and/or characters. c. Use a variety of techniques to sequence events so that they build on one another to create a coherent whole and build toward a particular tone and outcome (e.g., a sense of mystery, suspense, growth, or resolution). d. Use precise words and phrases, telling details, and sensory language to convey a vivid picture of the experiences, events, setting, and/or characters. e. Provide a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative.
Production and Distribution of Writing	
4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)	**4.** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grades 9–10.)	**5.** Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. (Editing for conventions should demonstrate command of Language standards 1–3 up to and including grades 11–12.)
6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.	**6.** Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
Research to Build and Present Knowledge	
7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	**7.** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.	**8.** Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

D. Grades 9–10 students:	E. Grades 11–12 students:
Research to Build and Present Knowledge (continued)	
9. Draw evidence from literary or informational texts to support analysis, reflection, and research. a. Apply *grades 9–10 Reading standards* to literature (e.g., "Analyze how an author draws on and transforms source material in a specific work [e.g., how Shakespeare treats a theme or topic from Ovid or the Bible or how a later author draws on a play by Shakespeare]"). b. Apply *grades 9–10 Reading standards* to literary nonfiction (e.g., "Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and fallacious reasoning").	**9.** Draw evidence from literary or informational texts to support analysis, reflection, and research. a. Apply *grades 11–12 Reading standards* to literature (e.g., "Demonstrate knowledge of eighteenth-, nineteenth- and early-twentieth-century foundational works of American literature, including how two or more texts from the same period treat similar themes or topics"). b. Apply *grades 11–12 Reading standards* to literary nonfiction (e.g., "Delineate and evaluate the reasoning in seminal U.S. texts, including the application of constitutional principles and use of legal reasoning [e.g., in U.S. Supreme Court Case majority opinions and dissents] and the premises, purposes, and arguments in works of public advocacy [e.g., *The Federalist*, presidential addresses]").
Range of Writing	
10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.	**10.** Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

2.3 College and Career Readiness Anchor Standards for Speaking and Listening

The grades 6–12 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to the College and Career Readiness (CCR) anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.

Comprehension and Collaboration

1.Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

2.Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.

3.Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric.

Presentation of Knowledge and Ideas

4.Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.

5.Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.

6.Adapt speech to a variety of contexts and communicative tasks, demonstrating command of formal English when indicated or appropriate.

2.3.1 Speaking and Listening Standards 6–12

The following standards for grades 6–12 offer a focus for instruction in each year to help ensure that students gain adequate mastery of a range of skills and applications. *Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.*

A. Grade 6 students:	**B. Grade 7 students:**	**C. Grade 8 students:**
Comprehension and Collaboration		
1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 6 topics, texts, and issues*, building on others' ideas and expressing their own clearly. a. Come to discussions prepared, having read or studied required material; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion. b. Follow rules for collegial discussions, set specific goals and deadlines, and define individual roles as needed. c. Pose and respond to specific questions with elaboration and detail by making comments that contribute to the topic, text, or issue under discussion. d. Review the key ideas expressed and demonstrate understanding of multiple perspectives through reflection and paraphrasing.	**1.** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 7 topics, texts, and issues*, building on others' ideas and expressing their own clearly. a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion. b. Follow rules for collegial discussions, track progress toward specific goals and deadlines, and define individual roles as needed. c. Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed. d. Acknowledge new information expressed by others and, when warranted, modify their own views.	**1.** Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 8 topics, texts, and issues*, building on others' ideas and expressing their own clearly. a. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion. b. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed. c. Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas. d. Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.
2. Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study.	**2.** Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.	**2.** Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.
3. Delineate a speaker's argument and specific claims, distinguishing claims that are supported by reasons and evidence from claims that are not.	**3.** Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and the relevance and sufficiency of the evidence.	**3.** Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.

A. Grade 6 students:	B. Grade 7 students:	C. Grade 8 students:
Presentation of Knowledge and Ideas		
4. Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.	**4.** Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.	**4.** Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.
5. Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information.	**5.** Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.	**5.** Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest.
6. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grade 6 Language standards 1 and 3 for specific expectations.)	**6.** Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grade 7 Language standards 1 and 3 for specific expectations.)	**6.** Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grade 8 Language standards 1 and 3 for specific expectations.)

The CCR anchor standards and high school grade-specific standards work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.

D. Grades 9–10 students:	**E. Grades 11–12 students:**
Comprehension and Collaboration	
1. Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 9–10 topics, texts, and issues*, building on others' ideas and expressing their own clearly and persuasively. a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed. c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions. d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.	**1.** Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grades 11–12 topics, texts, and issues*, building on others' ideas and expressing their own clearly and persuasively. a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. b. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed. c. Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives. d. Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.
2. Integrate multiple sources of information presented in diverse media or formats (e.g., visually, quantitatively, orally) evaluating the credibility and accuracy of each source.	**2.** Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.
3. Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.	**3.** Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.
Presentation of Knowledge and Ideas	
4. Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.	**4.** Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.	**5.** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
6. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English	**6.** Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English

when indicated or appropriate. (See grades 9–10 Language standards 1 and 3 for specific expectations.)	when indicated or appropriate. (See grades 11–12 Language standards 1 and 3 for specific expectations.)

2.4 College and Career Readiness Anchor Standards for Language

The grades 6–12 standards on the following pages define what students should understand and be able to do by the end of each grade. They correspond to the College and Career Readiness (CCR) anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.

Conventions of Standard English

1.Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

2.Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

Knowledge of Language

3.Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.

Vocabulary Acquisition and Use

4.Determine or clarify the meaning of unknown and multiple-meaning words and phrases by using context clues, analyzing meaningful word parts, and consulting general and specialized reference materials, as appropriate.

5.Demonstrate understanding of figurative language, word relationships, and nuances in word meanings.

6.Acquire and use accurately a range of general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

2.4.1 Language Standards 6–12

The following standards for grades 6–12 offer a focus for instruction each year to help ensure that students gain adequate mastery of a range of skills and applications. *Students advancing through the grades are expected to meet each year's grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.* Beginning in grade 3, skills and understandings that are particularly likely to require continued attention in higher grades as they are applied to increasingly sophisticated writing and speaking are marked with an asterisk (*). See the table on page 57 for a complete listing and Appendix A for an example of how these skills develop in sophistication.

A. Grade 6 students:	**B. Grade 7 students:**	**C. Grade 8 students:**
Conventions of Standard English		
1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. a. Ensure that pronouns are in the proper case (subjective, objective, possessive). b. Use intensive pronouns (e.g., *myself*, *ourselves*). c. Recognize and correct inappropriate shifts in pronoun number and person.* d. Recognize and correct vague pronouns (i.e., ones with unclear or ambiguous antecedents).* e. Recognize variations from standard English in their own and others' writing and speaking, and identify and use strategies to improve expression in conventional language.*	**1.** Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. a. Explain the function of phrases and clauses in general and their function in specific sentences. b. Choose among simple, compound, complex, and compound-complex sentences to signal differing relationships among ideas. c. Place phrases and clauses within a sentence, recognizing and correcting misplaced and dangling modifiers.*	**1.** Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. a. Explain the function of verbals (gerunds, participles, infinitives) in general and their function in particular sentences. b. Form and use verbs in the active and passive voice. c. Form and use verbs in the indicative, imperative, interrogative, conditional, and subjunctive mood. d. Recognize and correct inappropriate shifts in verb voice and mood.*
2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. a. Use punctuation (commas, parentheses, dashes) to set off nonrestrictive/parenthetical elements.* b. Spell correctly.	**2.** Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. a. Use a comma to separate coordinate adjectives (e.g., *It was a fascinating, enjoyable movie* but not *He wore an old[,] green shirt*). b. Spell correctly.	**2.** Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. a. Use punctuation (comma, ellipsis, dash) to indicate a pause or break. b. Use an ellipsis to indicate an omission. c. Spell correctly.
Knowledge of Language		

3. Use knowledge of language and its conventions when writing, speaking, reading, or listening. a. Vary sentence patterns for meaning, reader/listener interest, and style.* b. Maintain consistency in style and tone.*	**3.** Use knowledge of language and its conventions when writing, speaking, reading, or listening. a. Choose language that expresses ideas precisely and concisely, recognizing and eliminating wordiness and redundancy.*	**3.** Use knowledge of language and its conventions when writing, speaking, reading, or listening. a. Use verbs in the active and passive voice and in the conditional and subjunctive mood to achieve particular effects (e.g., emphasizing the actor or the action; expressing uncertainty or describing a state contrary to fact).

A. Grade 6 students:	**B. Grade 7 students:**	**C. Grade 8 students:**
Vocabulary Acquisition and Use		
4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grade 6 reading and content*, choosing flexibly from a range of strategies. a. Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. b. Use common, grade-appropriate Greek or Latin affixes and roots as clues to the meaning of a word (e.g., *audience*, *auditory*, *audible*). c. Consult reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning or its part of speech. d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).	**4.** Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grade 7 reading and content*, choosing flexibly from a range of strategies. a. Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. b. Use common, grade-appropriate Greek or Latin affixes and roots as clues to the meaning of a word (e.g., *belligerent*, *bellicose*, *rebel*). c. Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning or its part of speech. d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).	**4.** Determine or clarify the meaning of unknown and multiple-meaning words or phrases based on *grade 8 reading and content*, choosing flexibly from a range of strategies. a. Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. b. Use common, grade-appropriate Greek or Latin affixes and roots as clues to the meaning of a word (e.g., *precede*, *recede*, *secede*). c. Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning or its part of speech. d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).

5. Demonstrate understanding of figurative language, word relationships, and nuances in word meanings. a. Interpret figures of speech (e.g., personification) in context. b. Use the relationship between particular words (e.g., cause/effect, part/whole, item/category) to better understand each of the words. c. Distinguish among the connotations (associations) of words with similar denotations (definitions) (e.g., *stingy, scrimping, economical, unwasteful, thrifty*).	**5.** Demonstrate understanding of figurative language, word relationships, and nuances in word meanings. a. Interpret figures of speech (e.g., literary, biblical, and mythological allusions) in context. b. Use the relationship between particular words (e.g., synonym/antonym, analogy) to better understand each of the words. c. Distinguish among the connotations (associations) of words with similar denotations (definitions) (e.g., *refined, respectful, polite, diplomatic, condescending*).	**5.** Demonstrate understanding of figurative language, word relationships, and nuances in word meanings. a. Interpret figures of speech (e.g. verbal irony, puns) in context. b. Use the relationship between particular words to better understand each of the words. c. Distinguish among the connotations (associations) of words with similar denotations (definitions) (e.g., *bullheaded, willful, firm, persistent, resolute*).
6. Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.	**6.** Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.	**6.** Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

The CCR anchor standards and high school grade-specific standards work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.

D. Grades 9–10 students:	**E. Grades 11–12 students:**
Conventions of Standard English	
1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. a. Use parallel structure.* b. Use various types of phrases (noun, verb, adjectival, adverbial, participial, prepositional, absolute) and clauses (independent, dependent; noun, relative, adverbial) to convey specific meanings and add variety and interest to writing or presentations.	**1.** Demonstrate command of the conventions of standard English grammar and usage when writing or speaking. a. Apply the understanding that usage is a matter of convention, can change over time, and is sometimes contested. b. Resolve issues of complex or contested usage, consulting references (e.g., *Merriam-Webster's Dictionary of English Usage, Garner's Modern American Usage*) as needed.
2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. a. Use a semicolon (and perhaps a conjunctive adverb) to link two or more closely related independent clauses. b. Use a colon to introduce a list or quotation. c. Spell correctly.	**2.** Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. a. Observe hyphenation conventions. b. Spell correctly.
Knowledge of Language	
3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or	**3.** Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or

listening. a. Write and edit work so that it conforms to the guidelines in a style manual (e.g., *MLA Handbook*, Turabian's *Manual for Writers*) appropriate for the discipline and writing type.	listening. a. Vary syntax for effect, consulting references (e.g., Tufte's *Artful Sentences*) for guidance as needed; apply an understanding of syntax to the study of complex texts when reading.
Vocabulary Acquisition and Use	
4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grades 9–10 reading and content*, choosing flexibly from a range of strategies. a. Use context (e.g., the overall meaning of a sentence, paragraph, or text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. b. Identify and correctly use patterns of word changes that indicate different meanings or parts of speech (e.g., *analyze*, *analysis*, *analytical*; *advocate*, *advocacy*). c. Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, or its etymology. d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).	**4.** Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on *grades 11–12 reading and content*, choosing flexibly from a range of strategies. a. Use context (e.g., the overall meaning of a sentence, paragraph, or text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase. b. Identify and correctly use patterns of word changes that indicate different meanings or parts of speech (e.g., *conceive, conception, conceivable*). c. Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, its etymology, or its standard usage. d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).
5. Demonstrate understanding of figurative language, word relationships, and nuances in word meanings. a. Interpret figures of speech (e.g., euphemism, oxymoron) in context and analyze their role in the text. b. Analyze nuances in the meaning of words with similar denotations.	**5.** Demonstrate understanding of figurative language, word relationships, and nuances in word meanings. a. Interpret figures of speech (e.g., hyperbole, paradox) in context and analyze their role in the text. b. Analyze nuances in the meaning of words with similar denotations.
6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.	**6.** Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

3. Standards for Literacy in History/Social Studies, Science, and Technical Subjects: 6-12

3.1 College and Career Readiness Anchor Standards for Reading

The grades 6–12 standards on the following pages define what students should understand and be able to do by the end of each grade span. They correspond to the College and Career Readiness (CCR) anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.

Key Ideas and Details

1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

2. Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

3. Analyze how and why individuals, events, or ideas develop and interact over the course of a text.

Craft and Structure

4.Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

5.Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

6.Assess how point of view or purpose shapes the content and style of a text.

Integration of Knowledge and Ideas

7.Integrate and evaluate content presented in diverse formats and media, including visually and quantitatively, as well as in words.*

8.Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.

9.Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

Range of Reading and Level of Text Complexity

10. Read and comprehend complex literary and informational texts independently and proficiently.

*Please see "Research to Build and Present Knowledge" in Writing for additional standards relevant to gathering, assessing, and applying information from print and digital sources.

3.1.1 Reading Standards for Literacy in History/Social Studies 6–12

The standards below begin at grade 6; standards for K–5 reading in history/social studies, science, and technical subjects are integrated into the K–5 Reading standards. The CCR anchor standards and high school standards in literacy work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.

A. Grades 6–8 students:	**B. Grades 9–10 students:**	**C. Grades 11–12 students:**
Key Ideas and Details		
1. Cite specific textual evidence to support analysis of primary and secondary sources.	**1.** Cite specific textual evidence to support analysis of primary and secondary sources, attending to such features as the date and origin of the information.	**1.** Cite specific textual evidence to support analysis of primary and secondary sources, connecting insights gained from specific details to an understanding of the text as a whole.
2. Determine the central ideas or information of a primary or secondary source; provide an accurate summary of the source distinct from prior knowledge or opinions.	**2.** Determine the central ideas or information of a primary or secondary source; provide an accurate summary of how key events or ideas develop over the course of the text.	**2.** Determine the central ideas or information of a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas.
3. Identify key steps in a text's description of a process related to history/social studies (e.g., how a bill becomes law, how interest rates are raised or lowered).	**3.** Analyze in detail a series of events described in a text; determine whether earlier events caused later ones or simply preceded them.	**3.** Evaluate various explanations for actions or events and determine which explanation best accords with textual evidence, acknowledging where the text leaves matters uncertain.
Craft and Structure		

4. Determine the meaning of words and phrases as they are used in a text, including vocabulary specific to domains related to history/social studies.	**4.** Determine the meaning of words and phrases as they are used in a text, including vocabulary describing political, social, or economic aspects of history/social studies.	**4.** Determine the meaning of words and phrases as they are used in a text, including analyzing how an author uses and refines the meaning of a key term over the course of a text (e.g., how Madison defines *faction* in *Federalist* No. 10).
5. Describe how a text presents information (e.g., sequentially, comparatively, causally).	**5.** Analyze how a text uses structure to emphasize key points or advance an explanation or analysis.	**5.** Analyze in detail how a complex primary source is structured, including how key sentences, paragraphs, and larger portions of the text contribute to the whole.
6. Identify aspects of a text that reveal an author's point of view or purpose (e.g., loaded language, inclusion or avoidance of particular facts).	**6.** Compare the point of view of two or more authors for how they treat the same or similar topics, including which details they include and emphasize in their respective accounts.	**6.** Evaluate authors' differing points of view on the same historical event or issue by assessing the authors' claims, reasoning, and evidence.
Integration of Knowledge and Ideas		
7. Integrate visual information (e.g., in charts, graphs, photographs, videos, or maps) with other information in print and digital texts.	**7.** Integrate quantitative or technical analysis (e.g., charts, research data) with qualitative analysis in print or digital text.	**7.** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, as well as in words) in order to address a question or solve a problem.
8. Distinguish among fact, opinion, and reasoned judgment in a text.	**8.** Assess the extent to which the reasoning and evidence in a text support the author's claims.	**8.** Evaluate an author's premises, claims, and evidence by corroborating or challenging them with other information.
9. Analyze the relationship between a primary and secondary source on the same topic.	**9.** Compare and contrast treatments of the same topic in several primary and secondary sources.	**9.** Integrate information from diverse sources, both primary and secondary, into a coherent understanding of an idea or event, noting discrepancies among sources.
Range of Reading and Level of Text Complexity		
10. By the end of grade 8, read and comprehend history/social studies texts in the grades 6–8 text complexity band independently and proficiently.	**10.** By the end of grade 10, read and comprehend history/social studies texts in the grades 9–10 text complexity band independently and proficiently.	**10.** By the end of grade 12, read and comprehend history/social studies texts in the grades 11-CCR text complexity band independently and proficiently.

3.1.2 Reading Standards for Literacy in Science and Technical Subjects 6–12

A. Grades 6–8 students:	B. Grades 9–10 students:	C. Grades 11–12 students:
Key Ideas and Details		
1. Cite specific textual evidence to support analysis of science and technical texts.	**1.** Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.	**1.** Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.	**2.** Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.	**2.** Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.	**3.** Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.	**3.** Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
Craft and Structure		
4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 6–8 texts and topics.*	**4.** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics.*	**4.** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 11–12 texts and topics.*
5. Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.	**5.** Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., *force, friction, reaction force, energy*).	**5.** Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

6. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.	**6.** Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.	**6.** Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.
Integration of Knowledge and Ideas		
7. Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).	**7.** Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.	**7.** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
8. Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.	**8.** Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.	**8.** Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
9. Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.	**9.** Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.	**9.** Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

A. Grades 6–8 students:	**B. Grades 9–10 students:**	**C. Grades 11–12 students:**
Range of Reading and Level of Text Complexity		
10. By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.	**10.** By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.	**10.** By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.

3.2 College and Career Readiness Anchor Standards for Writing

The grades 6–12 standards on the following pages define what students should understand and be able to do by the end of each grade span. They correspond to the College and Career Readiness (CCR) anchor standards below by number. The CCR and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.

Text Types and Purposes*

1.Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence.

2.Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

3.Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details and well-structured event sequences.

Production and Distribution of Writing

4.Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

5.Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

6.Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

Research to Build and Present Knowledge

7.Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.

8.Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.

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9.Draw evidence from literary or informational texts to support analysis, reflection, and research.

Range of Writing

10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

*These broad types of writing include many subgenres. See Appendix A for definitions of key writing types. http://www.maine.gov/education/lres/ela/standards.html#appendixA

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3.2.1 Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects 6–12

The standards below begin at grade 6; standards for K–5 writing in history/social studies, science, and technical subjects are integrated into the K–5 Writing standards. The CCR anchor standards and high school standards in literacy work in tandem to define college and career readiness expectations—the former providing broad standards, the latter providing additional specificity.

A. Grades 6–8 students:	B. Grades 9–10 students:	C. Grades 11–12 students:
Text Types and Purposes		

A. Grades 6–8 students:	B. Grades 9–10 students:	C. Grades 11–12 students:
1. Write arguments focused on *discipline-specific content.* a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically. b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. c. Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence. d. Establish and maintain a formal style. e. Provide a concluding statement or section that follows from and supports the argument presented.	1. Write arguments focused on *discipline-specific content.* a. Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns. c. Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented.	1. Write arguments focused on *discipline-specific content.* a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases. c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. e. Provide a concluding statement or section that follows from or supports the argument presented.

A. Grades 6–8 students:	B. Grades 9–10 students:	C. Grades 11–12 students:
Text Types and Purposes (continued)		

A. Grades 6–8 students:	B. Grades 9–10 students:	C. Grades 11–12 students:
2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. a. Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension. b. Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples. c. Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts. d. Use precise language and domain-specific vocabulary to inform about or explain the topic. e. Establish and maintain a formal style and objective tone. f. Provide a concluding statement or section that follows from and supports the information or explanation presented.	**2.** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts. d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers. e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing. f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).	2. Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. a. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. b. Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. c. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. d. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers. e. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).
3. (See note; not applicable as a separate requirement)	**3.** (See note; not applicable as a separate requirement)	**3.** (See note; not applicable as a separate requirement)

Note: Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In history/social studies, students must be able to incorporate narrative accounts into their analyses of individuals or events of historical import. In science and technical subjects, students must be able to write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results.

A. Grades 6–8 students:	B. Grades 9–10 students:	C. Grades 11–12 students:
Production and Distribution of Writing		
4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	**4.** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.	**4.** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
5. With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.	**5.** Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.	**5.** Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
6. Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.	**6.** Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.	**6.** Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.
Research to Build and Present Knowledge		
7. Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.	**7.** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.	**7.** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
8. Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.	**8.** Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.	**8.** Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.
9. Draw evidence from informational texts to support analysis, reflection, and research.	**9.** Draw evidence from informational texts to support analysis, reflection, and research.	**9.** Draw evidence from informational texts to support analysis, reflection, and research.
Range of Writing		
10. Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a	**10.** Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single	**10.** Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a

day or two) for a range of discipline-specific tasks, purposes, and audiences.	sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.	day or two) for a range of discipline-specific tasks, purposes, and audiences.

HEALTH EDUCATION AND PHYSICAL EDUCATION

The Health Education and Physical Education Standards and performance indicators represent the essential knowledge and skills students need to be healthy individuals. Every day, students make decisions affecting their health and well-being: what foods to eat; what company to keep; what risks to take; and what to do for physical activity. These decisions often lead to habits that stay with them throughout life. The Health Education and Physical Education Standards will guide instruction that will help students make better decisions about their health. Through achievement of the Health Education and Physical Education Standards, students learn that their decisions can affect their health and set a pattern for their lives. Students also learn to protect their health by acquiring good information, by seeking good advice and friendships, and by taking responsibility for their own wellness which contributes to a healthy, active, balanced approach to life.

Health education gives students the knowledge and skills to thrive physically, mentally, emotionally, and socially. It contributes to students' ability to successfully practice behaviors that protect and promote health, and avoid and reduce health risks. Health education helps students to determine personal values and group norms that support healthy behaviors. Through comprehensive health education, students learn basic health concepts and influences on health. They develop the skills required to adopt, practice, and maintain health-enhancing and safe behaviors. These skills include: analyzing the reliability and validity of media and health resources; communicating effectively using refusal and conflict management skills; setting goals; and making healthy decisions. Health education helps students to be better consumers of information, manage stress, and make healthy decisions in the face of conflicting messages. It assists them in living healthier lives.

Physical education provides students with the skills and knowledge needed to support participation in a wide variety of physical activities that contribute to an active lifestyle. Physical education provides building blocks for skill development, skill analysis, physical fitness, stress reduction, decision-making, and positive social skills. Students learn to assess and set goals, evaluate their own physical fitness, and use the knowledge to maintain or improve their current fitness level. Students who participate in physical education on a regular basis learn the benefits of physical activity and its contribution to a healthy lifestyle.

OUTLINE OF HEALTH EDUCATION AND PHYSICAL EDUCATION STANDARDS AND PERFORMANCE INDICATOR LABELS

A. Health Concepts

1. **Healthy Behaviors and Personal Health**
2. **Dimensions of Health**
3. **Diseases/Other Health Problems**
4. **Environment and Personal Health**
5. **Growth and Development**
6. **Basic Health Concepts**

B. Health Information, Products, and Services

1. **Validity of Resources**

2. Locating Health Resources

C. Health Promotion and Risk Reduction

1. Healthy Practices and Behaviors
2. Avoiding/Reducing Health Risks
3. Self-Management

D. Influences on Health

1. Influences on Health Practices/Behaviors
2. Technology and Health
3. Compound Effect of Risky Behavior

E. Communication and Advocacy Skills

1. Interpersonal Communication Skills
2. Advocacy Skills

F. Decision-Making and Goal-Setting Skills

1. Decision-Making
2. Goal-Setting
3. Long-Term Health Plan

G. Movement/Motor Skills and Knowledge

1. Stability and Force
2. Movement Skills
3. Skill-Related Fitness Components
4. Skill Improvement

H. Physical Fitness Activities and Knowledge

1. Fitness Assessment
2. Health-Related Fitness Plan
3. Fitness Activity
4. Physical Activity Benefits

I. Personal and Social Skills and Knowledge

1. Cooperative Skills
2. Responsible Behavior
3. Safety Rules and Rules of Play

A.<u>Health Concepts:</u> Students comprehend concepts related to health promotion and disease prevention to enhance health.

A1 Healthy Behaviors and Personal Health

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students recognize that healthy behaviors impact personal health.	**Students explain the relationship between healthy behaviors and personal health.**	**Students examine the relationship between behaviors and personal health.** a. Explain the importance of assuming responsibility for personal health. b. Examine the relationship between healthy and unhealthy behaviors and personal health. c. Identify the possible barriers to practicing healthy behaviors.	**Students predict how behaviors can impact health status.** a. Analyze individual responsibility for enhancing health. b. Predict how healthy behaviors can positively impact health status. c. Describe barriers to practicing healthy behaviors. d. Examine *personal susceptibility* to, and the *potential severity* of, injury or illness if engaging in unhealthy behaviors.

A2 Dimensions of Health

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students recognize that there are multiple *dimensions of health*.	**Students identify examples of *physical, mental, emotional*, and *social health* during childhood.**	**Students explain the interrelationship of *physical, mental/intellectual, emotional*, and *social health*.**	**Students analyze the interrelationship of *physical, mental/intellectual, emotional,* and *social health*.**

A3 Diseases/Other Health Problems

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students describe the transmission	**Students describe ways to detect**	**Students identify causes of**	**Students explain causes of**

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
and prevention of common childhood communicable diseases.	**and treat common childhood diseases and other health problems.**	**common adolescent diseases and other health problems and describe ways to reduce, prevent, or treat them.**	**common diseases, disorders, and other health problems and propose ways to reduce, prevent, or treat them.**

A4 Environment and Personal Health

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students describe ways a safe and healthy school *environment* can promote personal health.	**Students describe ways a safe and healthy school and community *environment* can promote personal health.**	**Students determine how *environment* and other factors impact personal health.** a. Analyze how *environment* impacts personal health. b. Describe how *family history* can impact personal health. c. Explain how appropriate health care can promote personal health.	**Students determine the interrelationship between the *environment* and other factors and personal health.** a. Analyze how environment and personal health are interrelated. b. Describe how *genetics* and *family history* can impact personal health. c. Analyze the relationship between access to health care and health status.

A5 Growth and Development

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
No performance indicator.	**Students identify the general characteristics of human growth and development.**	**Students describe specific characteristics of adolescent human growth and development.**	**Students describe the characteristics of human growth and development throughout the various stages of life.**

A6 Basic Health Concepts

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify basic health terms related to family life; nutrition; personal health; safety and injury prevention; and tobacco, alcohol, and other drug use prevention.	**Students define basic health concepts related to family life; nutrition; personal health; safety and injury prevention; and tobacco, alcohol, and other drug use prevention.**	**Students explain essential health concepts related to family life; nutrition; personal health; safety and injury prevention; and tobacco, alcohol, and other drug use prevention.**	**Students analyze complex health concepts related to family life; nutrition; personal health; safety and injury prevention; and tobacco, alcohol, and other drug use prevention.**

B.<u>Health Information, Products and Services:</u> Students demonstrate the ability to access valid health information, services, and products to enhance health.

B1 Validity of Resources

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify trusted adults and professionals who can help promote health.	**Students identify characteristics of *valid health information, products, and services*.**	**Students analyze the *validity of health information, products, and services.***	**Students evaluate the *validity* and accessibility *of health information, products, and services*.**

B2 Locating Health Resources

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify ways to locate school and community health helpers.	**Students locate resources from home, school, and the community that provide *valid health information*.**	**Students locate *valid* and reliable *health information, products, and services.*** a. Explain situations requiring the use of *valid* and reliable *health information, products, and*	**Students access *valid* and reliable *health information, products, and services*.** a. Determine when professional health services may be required. b. Access *valid* and reliable *health*

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
		services. b. Locate *valid* and reliable *health information.* c. Locate *valid* and reliable *health products, and services.*	*information.* c. Access *valid* and reliable *health products and services.*

C. <u>Health Promotion and Risk Reduction</u>: Students demonstrate the ability to practice health-enhancing behaviors and avoid or reduce health risks.

C1 Healthy Practices and Behaviors

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students demonstrate age-appropriate healthy practices to maintain or improve personal health. a. Choose healthy foods. b. Demonstrate personal hygiene skills, including hand-washing.	**Students demonstrate age-appropriate healthy practices and/or behaviors to maintain or improve personal health.** a. Design healthy menus. b. Demonstrate basic care of the human body.	**Students demonstrate a healthy practice and/or behavior to maintain or improve their own health in each of the following areas: personal hygiene, healthy eating; physical activity; and tobacco, alcohol, and other drug use prevention.**	**Students demonstrate healthy practices and/or behaviors to maintain or improve the health of self and others in each of the following areas: healthy eating; physical activity; tobacco, alcohol, and other drug use prevention; and prevention of *STDs*, *HIV* and unintended pregnancy.**

C2 Avoiding/Reducing Health Risks

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students demonstrate behaviors to avoid or reduce personal health risks.	**Students demonstrate a variety of behaviors to avoid or reduce personal health risks.**	**Students demonstrate behaviors to avoid or reduce health risks to self and others.**	**Students demonstrate a variety of behaviors to avoid or reduce health risks to self and others.**

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
a. Demonstrate a variety of safety skills for different situations. b. Differentiate between safe and harmful substances found at home and school. c. Recognize basic signs, symbols, and warning labels for health and safety.	a. Demonstrate healthy and safe ways to recognize, deal with, or avoid threatening situations. b. Develop injury prevention and safety strategies for personal health.	a. Demonstrate ways to recognize, avoid, or change situations that threaten the safety of self and others. b. Develop injury prevention and response strategies including first aid for personal and family health.	a. Develop ways to recognize, avoid, or change situations that threaten the safety of self and others. b. Develop injury prevention and response strategies including first aid for personal, family, and community health.

C3 Self-Management

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students demonstrate coping strategies to use when feeling too excited, anxious, upset, angry, or out of control.	**Students demonstrate strategies that can be used to manage stress, anger, or grief.**	**Students distinguish between healthy and unhealthy strategies for stress, anger, and grief management.**	**Students design, implement, and evaluate a plan for stress management.**

D. <u>Influences on Health:</u> Students analyze the ability of family, peers, culture, media, technology, and other factors to enhance health.

D1 Influences on Health Practices/Behaviors

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify influences on personal health practices and behaviors. a. Identify family influences on personal health practices and	**Students describe how a variety of factors influence personal health behaviors.** a. Describe how family, school, and community influence and support	**Students explain and analyze influences on adolescent health behaviors.** a. Examine how the family, school, and community influence the	**Students analyze and evaluate influences on health and health behaviors.** a. Analyze how family, school and community influence the health of

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
behaviors. b. Identify what the school can do to support personal health practices and behaviors. c. Describe how the media can influence health behaviors.	personal health practices and behaviors. b. Describe how peers and *culture* can influence health practices and behaviors. c. Explain how media influences thoughts, feelings, and health behaviors.	health behaviors of adolescents. b. Describe how peers influence healthy and unhealthy behaviors. c. Analyze how messages from media influence health behaviors. d. Explain how the *perceptions of norms* influence healthy and unhealthy behaviors. e. Explain how *culture* and personal values and beliefs influence individual health behaviors.	individuals. b. Analyze how peers influence healthy and unhealthy behaviors. c. Evaluate the effect of the media on personal and family health. d. Analyze how the perceptions of norms influence healthy and unhealthy behaviors. e. Analyze how *culture* and personal values and beliefs influence individual health behaviors. f. Investigate how public health policies and government regulations can influence health promotion and disease prevention.

D2 Technology and Health

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
No performance indicator.	**Students describe ways technology can influence personal health.**	**Students analyze the influence of technology, including medical technology, on personal and family health.**	**Students evaluate the impact of technology, including medical technology, on personal, family, and community health.**

D3 Compound Effect of Risk Behavior

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
No performance indicator.	**No performance indicator.**	**Students describe how some health risk behaviors can influence the likelihood of engaging in unhealthy behaviors.** a. Describe how *gateway drugs* can lead to the use of other drugs. b. Describe the influence of alcohol and other drug use on judgment and self-control.	**Students analyze how some health risk behaviors can influence the likelihood of engaging in unhealthy behaviors.** a. Analyze the influence of alcohol use on individual and group behavior. b. Analyze the influence of drug use on individual and group behavior.

E. **Communication and Advocacy Skills: Students demonstrate the ability to use interpersonal communication and advocacy skills to enhance personal, family, and community health.**

E1 Interpersonal Communication Skills

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students demonstrate healthy ways to communicate. a. Demonstrate healthy ways to express needs, wants, and feelings. b. Distinguish between verbal and nonverbal communication. c. Make requests to promote personal health. d. Demonstrate listening skills to	**Students demonstrate effective verbal and nonverbal *interpersonal communication* skills to enhance health.** a. Demonstrate appropriate listening skills to enhance health. b. Demonstrate effective verbal and non-verbal communication skills including assertiveness skills to enhance health.	**Students apply effective verbal and nonverbal *interpersonal communication* skills to enhance health.** a. Demonstrate communication skills to build and maintain healthy relationships. b. Demonstrate effective communication skills including asking for assistance to enhance	**Students utilize skills for communicating effectively with family, peers, and others to enhance health.** a. Demonstrate effective communication skills including asking for and offering assistance to enhance the health of self and others. b. Demonstrate refusal, negotiation,

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
enhance health. e. Demonstrate ways to respond to an unwanted, threatening, or dangerous situation including telling a trusted adult if threatened or harmed.	c. Demonstrate how to ask for assistance to enhance personal health. d. Demonstrate refusal skills to avoid or reduce health risks. e. Demonstrate non-violent strategies to manage or resolve conflict.	the health of self and others. c. Demonstrate refusal and negotiation skills to avoid or reduce health risks. d. Demonstrate effective conflict management or conflict resolution strategies.	and collaboration skills to enhance health and avoid and reduce health risks. c. Demonstrate strategies to prevent, manage, or resolve interpersonal conflicts without harming self or others.

E2 Advocacy Skills

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students encourage peers to make positive health choices.	**Students encourage others to make positive health choices.** a. Express opinions about health issues. b. Give accurate information about health issues.	**Students describe ways to influence and support others in making positive health choices.** a. Develop a health-enhancing position on a topic and support it with information. b. Develop health-enhancing messages using communication techniques that target a specific audience. c. Demonstrate an ability to work cooperatively as an advocate for healthy individuals, families, and schools.	**Students demonstrate ways to influence and support others in making positive health choices.** a. Utilize accurate peer and societal norms to formulate a health-enhancing message. b. Adapt health messages and communication techniques for different audiences. c. Demonstrate an ability to work cooperatively as an advocate for improving personal, family, and community health.

F. <u>Decision-Making and Goal-Setting Skills</u>: Students demonstrate the ability to make decisions and set goals to enhance health.

F1 Decision-Making

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify situations where a health-related decision is needed. a. Differentiate between situations when health-related decisions can appropriately be made by the individual and when assistance is needed.	**Students apply *decision-making* steps to enhance health.** a. Identify health-related situations that might require a thoughtful decision. b. List healthy options to health-related issues or problems and predict the potential outcomes of each option when making a health-related decision. c. Choose a healthy option when making a decision. d. Describe the outcome of a health-related decision.	**Students apply *decision-making* skills to enhance health.** a. Determine when health-related situations require the application of a thoughtful *decision-making* process. b. Determine when individual or collaborative *decision-making* is appropriate. c. Distinguish between healthy and unhealthy alternatives to health-related issues or problems and predict the potential short-term impact of alternative decisions for themselves and others. d. Choose healthy alternatives over unhealthy alternatives when making a decision. e. Analyze the outcomes of a health-related decision.	**Students apply a *decision-making* process to enhance health.** a. Compare the value of thoughtful *decision-making* to quick *decision-making* in a health-related situation. b. Justify when individual or collaborative *decision-making* is appropriate. c. Generate alternative approaches to situations involving health-related decisions and predict the potential short-term and long-term impact for themselves and others for each alternative. d. Defend the healthy choice when making a decision. e. Evaluate the effectiveness of a health-related decision.

F2 Goal-Setting

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify a short-term personal health goal and take	**Students utilize *goal-setting* skills to implement a short-term personal**	**Students develop and apply strategies to attain a short-term**	**Students develop and analyze a plan to attain a personal health**

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
action toward achieving the goal.	**health goal.** a. Set a short-term personal health goal. b. Identify resources to assist in achieving the health goal. c. Track progress toward achieving the goal.	**personal health goal.** a. Assess personal health practices. b. Develop a short-term goal to adopt, maintain, or improve a personal health practice. c. Develop and apply strategies and monitor progress toward a personal health goal. d. Describe how personal health goals can vary with changing abilities, priorities, and responsibilities.	**goal.** a. Assess personal health practices and overall health status. b. Develop a plan to attain a short-term personal health goal that addresses strengths, needs, and risks. c. Implement strategies and analyze progress in achieving a personal health goal.

F3 Long-Term Health Plan

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
No performance indicator.	**No performance indicator.**	**No performance indicator.**	**Students formulate a long-term personal health plan, incorporating *decision-making* and *goal-setting* strategies.**

G. <u>Movement/Motor Skills and Knowledge</u>: Students demonstrate the *fundamental and specialized movement skills* and apply *principles of movement* for improved performance.

G1 Stability and Force

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students demonstrate positions that create stability and force. a. Show how base of support changes during *static balances*. b. Demonstrate how body position can be adapted to pushing and pulling forces. c. Demonstrate how to lift objects to prevent injuries.	**Students demonstrate a variety of movements that apply stability and force.** a. Demonstrate movements that change the *center of gravity and line of gravity* during *dynamic balances.* b. Show how increasing speed and mass can change the force on an object. c. Demonstrate how body position can be changed to absorb force and decrease risk for injury.	**Students change their motion and the motion of objects by applying the principles of stability and force during skill practice.** a. Demonstrate the *principle of opposition*. b. Demonstrate how the point of contact changes the path of an object. c. Demonstrate how the point of release changes the path of an object. d. Demonstrate lifts and actions that decrease risk for injury.	**Students change their motion and the motion of objects by applying the principles of stability and force to modify their performance in games/physical activities.** a. Demonstrate how spin and rebound affect the motion of an object. b. Use the *principle of opposition*, point of contact, and point of release to change the path of an object during a game/physical activity. c. Adjust movements to accommodate external forces that decrease risk for injury.

G2 Movement Skills

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students demonstrate a variety of *locomotor skills*. a. Demonstrate correct technique for a variety of *locomotor skills*. b. Demonstrate a *locomotor skill*	**Students demonstrate a variety of *locomotor skills* and *manipulative skills*.** a. Demonstrate correct technique for a variety of *manipulative skills.*	**Students demonstrate *motor skills* and *manipulative skills* during drills or modified games/physical activities.** a. Demonstrate correct technique for	**Students demonstrate a variety of *specialized movement skills* specific to a game/physical activity while participating in a game/physical activity.**

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
applying changes in direction, level, and/or pathway. c. Demonstrate combinations of *locomotor skills*.	b. Demonstrate *locomotor skills* and *manipulative skills* in combination using changes in direction, level, or pathway.	*motor skills* and *manipulative skills* during drills or modified games/physical activities. b. Combine *manipulative skills* with *motor skills* during drills or modified games/physical activities.	

G3 Skill-Related Fitness Components

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify the skill-related fitness components of balance and coordination.	**Students identify the skill-related fitness components of balance, coordination, agility, and speed.**	**Students describe the following skill-related fitness components: balance, coordination, agility, speed, and power.**	**Students explain the relationship of skill-related fitness components to *specialized movement skills*.**

G4 Skill Improvement

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
No performance indicator. Although no performance indicator is stated, students are expected to have instructional experiences that help them to understand the importance of practice.	**Students describe why practice is important to skill improvement.**	**Students explain how specific, positive, and correct feedback affect skill improvement.**	**Students design appropriate practice sessions, utilizing *fundamental movement skills* to improve performance.**

H.<u>Physical Fitness Activities and Knowledge</u>: Students demonstrate and apply fitness concepts.

H1 Fitness Assessment

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
No performance indicator.	**Students participate in multiple *health-related fitness assessments* (including a cardiovascular assessment) and reassess to observe changes over time.**	**Students participate in a *health-related fitness assessment* that addresses a variety of health-related fitness components to establish personal fitness goals.**	**Students participate in a health-*related fitness assessment* to establish personal fitness goals and reassess their fitness over time.**

H2 Health-Related Fitness Plan

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify components of health-related fitness.	**Students describe and give examples of the five *health-related fitness components*.**	**Students design a fitness program from established goals which addresses the five *health-related fitness components* and applies the frequency, intensity, time, and type *(FITT) guidelines*.**	**Students design and critique a personal fitness plan, from established goals, that applies the five *health-related fitness components* and the *principles of training* (specificity, overload, and progression).**

H3 Fitness Activity

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students participate in physical activities to introduce the *health-related fitness components* of *flexibility, cardiovascular endurance, muscular endurance, and muscular strength*.	**Students participate in physical activities that address each of the five *health-related fitness components* including *flexibility, cardiovascular endurance, muscular endurance, muscular strength, and body composition.***	**Students participate in physical activities that address personal fitness goals for the *health-related fitness components* including *flexibility, cardiovascular endurance, muscular endurance, muscular strength, and body composition.***	**Students select and participate in physical activities that address their personal fitness plans and apply the five *health-related fitness components.***

H4 Physical Activity Benefits

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify the physical benefits and bodily responses related to physical activities.	**Students identify physical and mental benefits and bodily responses related to regular participation in physical activity.**	**Students describe physiological responses and physical, mental/intellectual, emotional, and social benefits related to regular participation in physical activity.**	**Students explain the interrelationship of physiological responses and physical, mental/intellectual, emotional, and social benefits related to regular participation in physical activity.**

I.Personal and Social Skills and Knowledge: Students demonstrate and explain responsible personal behavior and responsible social behavior in physical activity settings.

I1 Cooperative Skills

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students demonstrate taking turns and sharing while participating in physical activities.	**Students demonstrate cooperative skills while participating in physical activities.** a. Demonstrate active listening. b. Get along with others. c. Accept responsibility for personal behavior.	**Students demonstrate cooperative and inclusive skills while participating in physical activities.** a. Work together as a team. b. Respond appropriately to peer pressure. c. Manage conflict. d. Engage peers respectfully in activities.	**Students demonstrate collaborative skills while participating in physical activities.** a. Accept constructive feedback. b. Give constructive feedback. c. Include peers respectfully in activities.

I2 Responsible Behavior

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students follow procedures for safe behaviors, including maintaining appropriate personal space, while participating in physical activities.	**Students demonstrate safe behaviors and appropriate equipment use while participating in physical activities.**	**Students demonstrate responsible personal behaviors while participating in physical activities.**	**Students demonstrate responsible and ethical personal behavior while participating in physical activities.**

I3 Safety Rules and Rules of Play

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify safety rules and rule of play for games/physical activities.	**Students describe safety rules and rules of play for games/physical activities.**	**Students describe game/physical activity rules and safety rules and their purposes.** a. Explain the purposes for modifying playing rules in specified situations. b. Explain the safety rules and possible risks associated with specific games/physical activities.	**Students predict how etiquette/rules improve games/activities.** a. Explain how etiquette/rules contribute to productive participation. b. Predict how modifications to the environment can impact safety during games/physical activities.

MATHEMATICS

~~Education must equip all students with mathematical skills and ways of thinking that provide them with the flexibility, adaptability, and creativity to function as productive citizens in the changing society of the 21st century. Mathematical understanding must extend beyond the skills of calculation and manipulation of numbers and symbols to the use of mathematics to investigate, predict, analyze, interpret, create, and evaluate.~~

~~Deep mathematical understanding develops over time. While performance indicators describe the knowledge and skills expected at a given grade level, these concepts and skills may be introduced in previous years. They will also be used in later years as the foundations for more advanced topics or in new problem situations.~~

~~The use of "understand" in this document is intended to communicate the desired depth and breadth of mathematics programs for Maine students. To understand a procedure or concept means to be able to:~~

- ~~communicate its meaning, its use, the results of its application, and its implications for a given context,~~
- ~~reason about it by making conjectures and justifying conclusions,~~
- ~~represent it in a variety of ways,~~
- ~~connect it to other ideas in and outside of mathematics, and~~
- ~~know when and how to apply it to solve problems in mathematics and in other contexts.~~

~~Central to mathematical understanding is learning through problems that arise in mathematics and applied contexts. To this end, students learn to identify problems, formulate approaches, carry out these approaches, and communicate and justify solutions. Mathematical reasoning pervades all areas of mathematics. Mathematical reasoning is manifested through classification, comparison, deduction, induction, generalization, justification, verification, and spatial visualization.~~

~~As growing mathematicians, students need to do mathematics and see themselves as capable of developing their own understanding of mathematical concepts, properties, and procedures. Mathematics classrooms should provide practical experiences using mathematics in everyday applications and in other content areas, as well as explorations solely within mathematics. Discussing mathematics is an important component of developing mathematical understanding. Technology should be used as an aid to understanding mathematical ideas. Classrooms that reflect these beliefs prepare students to be confident and effective mathematical thinkers.~~

~~As lifelong learners students will research mathematics concepts and methods. They must learn about sources of mathematics information, how to read and comprehend mathematics, how to employ the mathematical ideas they learn, and how to communicate what they learn.~~

~~The State of Maine should expect its students to enjoy, appreciate, and use mathematics. Students who are challenged to master the Mathematics Standards and are supported in reaching them will be better prepared for a future in which mathematics will be increasingly important in all areas of endeavor.~~

~~**OUTLINE OF MATHEMATICS STANDARDS AND PERFORMANCE INDICATORS**~~

~~**A. Number**~~
~~**Whole Number**~~
~~**Rational Number**~~
~~**Real Number**~~

	~~Whole Number~~	~~Rational Number~~	~~Real Number~~
~~Performance Indicators PreK - 2~~	~~1, 2~~	~~3~~	~~none~~
~~Performance Indicators Grade 3~~	~~1, 2, 3~~	~~4~~	~~none~~
~~Performance Indicators Grade 4~~	~~1, 2, 3~~	~~4, 5~~	~~none~~
~~Performance Indicators Grade 5~~	~~1, 2, 3~~	~~4, 5, 6~~	~~none~~
~~Performance Indicators Grade 6~~	~~1~~	~~2, 3, 4, 5~~	~~none~~
~~Performance Indicators Grade 7~~	~~none~~	~~1, 2, 3, 4~~	~~none~~
~~Performance Indicators Grade 8~~	~~none~~	~~none~~	~~1~~
~~Performance Indicators 9 - Diploma~~	~~none~~	~~none~~	~~1~~

~~**B. Data**~~
~~**Measurement and Approximation**~~
~~**Data Analysis**~~
~~**Probability**~~

	~~Measurement and Approximation~~	~~Data Analysis~~	~~Probability~~
~~Performance Indicators PreK - 2~~	~~1~~	~~2~~	~~none~~
~~Performance Indicators Grade 3~~	~~1~~	~~2~~	~~none~~
~~Performance Indicators Grade 4~~	~~1~~	~~2~~	~~none~~
~~Performance Indicators Grade 5~~	~~1~~	~~2, 3~~	~~none~~
~~Performance Indicators Grade 6~~	~~1~~	~~2, 3~~	~~none~~
~~Performance Indicators Grade 7~~	~~none~~	~~1~~	~~2~~

~~**Performance Indicators Grade 8**~~	~~**1, 2**~~	~~**3**~~	~~**4**~~
~~**Performance Indicators 9 - Diploma**~~	~~**1**~~	~~**2, 3, 4**~~	~~**5**~~

~~**C. Geometry**~~
~~**Geometric Figures**~~
~~**Geometric Measurement**~~
~~**Transformations**~~

	~~**Geometric Figures**~~	~~**Geometric Measurement**~~	~~**Transformations**~~
~~**Performance Indicators PreK - 2**~~	~~**1**~~	~~**2**~~	~~**none**~~
~~**Performance Indicators Grade 3**~~	~~**1**~~	~~**2**~~	~~**none**~~
~~**Performance Indicators Grade 4**~~	~~**1**~~	~~**2**~~	~~**3**~~
~~**Performance Indicators Grade 5**~~	~~**1**~~	~~**2, 3, 4**~~	~~**3**~~
~~**Performance Indicators Grade 6**~~	~~**1**~~	~~**2, 3**~~	~~**4, 5**~~
~~**Performance Indicators Grade 7**~~	~~**1**~~	~~**2**~~	~~**3**~~
~~**Performance Indicators Grade 8**~~	~~**1, 2, 3**~~	~~**4**~~	~~**none**~~
~~**Performance Indicators 9 - Diploma**~~	~~**1, 2, 3**~~	~~**4**~~	~~**none**~~

~~**D. Algebra**~~
~~**Symbols and Expressions**~~
~~**Equations and Inequalities**~~
~~**Functions and Relations**~~

	~~**Symbols and Expressions**~~	~~**Equations and Inequalities**~~	~~**Functions and Relations**~~
~~**Performance Indicators PreK - 2**~~	~~**1**~~	~~**2**~~	~~**3, 4**~~
~~**Performance Indicators Grade 3**~~	~~**1**~~	~~**2**~~	~~**3**~~
~~**Performance Indicators Grade 4**~~	~~**1**~~	~~**2**~~	~~**3**~~
~~**Performance Indicators Grade 5**~~	~~**1**~~	~~**2**~~	~~**3**~~

~~**Performance Indicators Grade 6**~~	~~**1**~~	~~**2**~~	~~**3**~~
~~**Performance Indicators Grade 7**~~	~~**1**~~	~~**2**~~	~~**3**~~
~~**Performance Indicators Grade 8**~~	~~**1, 2**~~	~~**2, 3**~~	~~**4**~~
~~**Performance Indicators 9 - Diploma**~~	~~**1**~~	~~**2, 3**~~	~~**4, 5**~~

~~**A. NUMBER: Students use numbers in everyday and mathematical contexts to quantify or describe phenomena, develop concepts of operations with different types of numbers, use the structure and properties of numbers with operations to *solve* problems, and perform mathematical computations. Students develop number sense related to magnitude, estimation, and the effects of mathematical operations on different types of numbers. It is expected that students use numbers flexibly, using forms of numbers that best match a situation. Students compute efficiently and *accurately*. *Estimation* should always be used when computing with numbers or solving problems.**~~

~~**Whole Number**~~

~~**Pre-K-2 Performance Indicators & Descriptors**~~
~~**1 Students *understand* and use number notation and place value to 1000 in numerals.**~~ ~~a. Read and write numbers to 1000 using numerals.~~ ~~b. Recognize the place values of digits in numbers (hundreds, tens, and ones).~~ ~~c. Compare and order one-digit, two-digit, and three-digit numbers.~~ ~~**2 Students *understand* and use procedures to add and subtract whole numbers with one and two digits.**~~ ~~a. Use and explain multiple strategies for computation.~~ ~~b. Use an operation appropriate to a given situation.~~

~~**Whole Number**~~

~~**Performance Indicators & Descriptors**~~					
~~**3**~~	~~**4**~~	~~**5**~~	~~**6**~~	~~**7**~~	~~**8**~~
~~**1 Students *understand* and use number notation and place value to 10,000 in**~~	~~**1 Students *understand* and use number notation and place value to 100,000 in**~~	~~**1 Students *understand* and use number notation to 10 million in numerals**~~	~~**1 Students use factors and multiples.**~~ ~~a. Identify prime~~	~~**No performance indicator.**~~ ~~It is expected that students continue to use~~	~~**No performance indicator.**~~ ~~It is expected that students continue to use~~

Performance Indicators & Descriptors					
~~3~~	~~4~~	~~5~~	~~6~~	~~7~~	~~8~~
~~**numerals.**~~ ~~a. Read and write numbers up to 10,000 in numerals and words.~~ ~~b. Recognize the place values of digits in numbers up to 10,000.~~ ~~c. Compare and order numbers with up to four digits.~~ ~~**2 Students *understand* and use procedures to add and subtract whole numbers with up to four digits.**~~ ~~a. Display an understanding of the base ten place value system.~~ ~~b. Use an operation appropriate to a given situation.~~ ~~**3 Students**~~	~~**numerals.**~~ ~~a. Read and write numbers up to 100,000 in numerals and words.~~ ~~b. Recognize the place value of digits in numbers to 100,000.~~ ~~c. Compare and order numbers with up to five digits.~~ ~~d. Round numbers to the nearest 100 or 1000.~~ ~~**2 Students *understand* and use the concepts of factor and multiple.**~~ ~~a. Determine if a single-digit number is a factor of a given whole number.~~ ~~b. Determine if a whole number is a multiple of a given single-digit number.~~ ~~c. List the first ten multiples of a given~~	~~**and words.**~~ ~~a. Read and write numbers to 10 million in numerals.~~ ~~b. Round numbers to the place value appropriate for given contexts.~~ ~~c. Compare and order numbers up to 10 million.~~ ~~**2 Students multiply and divide numbers up to four digits by numbers up to two digits, and by tens, hundreds, and thousands and *interpret* any remainders.**~~ ~~**3 Students *solve* problems requiring multiple operations (addition, subtraction, multiplication, and division) and use**~~	~~numbers and composite numbers and use their properties to *solve* problems.~~ ~~b. Use the property that every integer greater than one is a prime number or can be written as a unique product of prime numbers.~~ ~~c. *Interpret* and use exponential notation as repeated multiplication.~~ ~~d. Find the least common multiple and greatest common factor of two numbers.~~	~~prior concepts and skills in new and familiar contexts.~~	~~prior concepts and skills in new and familiar contexts.~~

~~**Performance Indicators & Descriptors**~~					
~~**3**~~	~~**4**~~	~~**5**~~	~~**6**~~	~~**7**~~	~~**8**~~
~~***understand* and apply meanings of multiplication and division.**~~ ~~a. Multiply single-digit numbers and divide using single-digit divisors and up to two-digit dividends (division facts only, but remainders may be present).~~ ~~b. Use an operation appropriate to a given situation.~~ ~~c. Recognize and use models for multiplication and division situations.~~ ~~d. Use multiple strategies for multiplication and division.~~	~~number.~~ ~~**3 Students *understand* and use procedures to multiply and divide whole numbers by two-digit numbers.**~~ ~~a. Multiply up to four-digit numbers by a single-digit number.~~ ~~b. Multiply three-digit numbers by two-digit numbers.~~ ~~c. Divide whole numbers up to four digits by a single-digit number and by ten (remainders may be present).~~	~~**the conventions of order of operations (no exponents expected).**~~			

~~**Whole Number**~~
~~**9-Diploma Performance Indicators & Descriptors**~~
~~**No performance indicator.**~~ ~~Although no performance indicators are stated, students are expected to continue to use prior concepts and skills in new and familiar contexts.~~

Rational Number

Pre-K-2 Performance Indicators & Descriptors
3 Students recognize unit fractions including 1/2, 1/4, and 1/3.

Rational Number

Performance Indicators & Descriptors					
3	**4**	**5**	**6**	**7**	**8**
4 Students recognize, name, compare, illustrate, and use simple fractions. a. Recognize, name, and illustrate fractions with denominators from two to ten. b. Recognize, name, and illustrate parts of a whole. c. Compare and order fractions with like numerators or with like denominators.	**4 Students *understand*, name, compare, illustrate, combine, and use fractions.** a. Add and subtract fractions with like denominators and use repeated addition to multiply a unit fraction by a whole number. b. List equivalent fractions. c. Represent fractions greater than one as mixed numbers and mixed numbers as fractions. **5 Students *understand* and use number notation and place value in numbers**	**4 Students *understand*, name, compare, illustrate, compute with, and use fractions.** a. Add and subtract fractions with unlike denominators. b. Multiply a fraction by a whole number. **5 Students *understand* and use number notation and place value in numbers with three decimal places.** a. Compare, order, read, round, and *interpret* decimals with up to three decimal places. b. Add and subtract	**2 Students express fractions greater than 0 as decimals and compare positive numbers that are written as fractions and decimals and place them on the number line.** **3 Students add, subtract, multiply, and divide numbers expressed as fractions and as decimals including mixed numbers.** **4 Students *understand* how to express relative quantities as percentages and as decimals and**	**1 Students use negative and positive rational numbers expressed as integers, fractions, and decimals.** a. Recognize rational numbers as quotients of integers with a non-zero denominator and recognize that rational numbers can be negative or positive. b. Compare signed rational numbers and place them on the number line. **2 Students compute with signed rational numbers.**	**1 Students express or *interpret* numbers using scientific notation from real-life contexts.** a. Use positive and negative integer exponents for powers of ten. b. Convert between standard and scientific notation forms and compare the relative size of numbers including the *interpretation* of numbers as displayed on calculators and computers.

~~Performance Indicators & Descriptors~~					
~~3~~	~~4~~	~~5~~	~~6~~	~~7~~	~~8~~
	~~**with two decimal places in real-world contexts including money.**~~ ~~a. Compare, order, read, round, and *interpret* decimals with up to two decimal places.~~ ~~b. Add and subtract decimals with up to two decimal places.~~ ~~c. Multiply and divide decimals with up to two decimal places by a one-digit whole number.~~ ~~d. Connect equivalent decimals and fractions for 1/10s, 1/4s and 1/2s in meaningful contexts.~~	~~decimals with up to three decimal places.~~ ~~c. Multiply and divide decimals with up to three decimals places by a two-digit whole number.~~ ~~d. Develop the concept of a fraction as division through expressing fractions with denominators of two, four, five, and 10, as decimals and decimals as fractions.~~ ~~**6 Students *understand* concepts of positive and negative integers.**~~ ~~a. Place positive and negative integers on a number line or scale.~~ ~~b. Compare and order positive and negative integers.~~	~~**fractions.**~~ ~~a. Use ratios to describe relationships between quantities.~~ ~~b. Use decimals, fractions, and percentages to express relative quantities.~~ ~~c. *Interpret* relative quantities expressed as decimals, fractions, and percentages.~~ ~~**5 Students multiply and divide decimals with up to three decimal places by tens, hundreds, and thousands.**~~	~~a. Use and *interpret* exponents.~~ ~~b. Follow conventions of order of operations including exponents.~~ ~~c. Solve problems using signed rational numbers.~~ ~~**3 Students *understand* that when the ratio of two varying quantities is constant, the two quantities are in direct proportion.**~~ ~~a. Use ratios to compare quantities and use comparison to solve problems.~~ ~~b. Identify proportional relationships.~~ ~~c. Use proportions to *solve* problems.~~ ~~**4 Students *interpret* and use percents to *solve* problems.**~~	

Words in *blue italics* are defined in the glossary available online at http://www.maine.gov/education/lres/review/glossary.pdf

Highlighted = Maine Department of Education Regulation 131

~~Performance Indicators & Descriptors~~					
~~3~~	~~4~~	~~5~~	~~6~~	~~7~~	~~8~~
		~~c. Find the distance between two integers in a context.~~		~~a. Use percents when comparing fractional parts of sets of unequal size.~~ ~~b. *Solve* practical problems involving percents.~~	

~~Rational Number~~

~~9-Diploma Performance Indicators & Descriptors~~

~~No performance indicator.~~

~~Although no performance indicators are stated, students are expected to have instructional experiences in which they continue to use prior concepts and skills in new and familiar contexts.~~

~~Real Number~~

~~Pre-K-2 Performance Indicators & Descriptors~~

~~No performance indicator.~~

~~Although no performance indicators are stated, students are expected to use only rational numbers at this level.~~

~~Real Number~~

~~Performance Indicators & Descriptors~~					
~~3~~	~~4~~	~~5~~	~~6~~	~~7~~	~~8~~
~~No performance indicator.~~ ~~Although no performance indicators~~	**~~No performance indicator.~~** ~~Although no performance indicators~~	**~~No performance indicator.~~** ~~Although no performance indicators~~	**~~No performance indicator.~~** ~~Although no performance indicators~~	**~~No performance indicator.~~** ~~Although no performance indicators~~	**~~1 Students *understand* the set of real numbers as containing the rational numbers~~**

~~**Performance Indicators & Descriptors**~~					
~~**3**~~	~~**4**~~	~~**5**~~	~~**6**~~	~~**7**~~	~~**8**~~
~~are stated, students are expected to have instructional experiences in which they use only rational numbers.~~	~~are stated, students are expected to have instructional experiences in which they use only rational numbers.~~	~~are stated, students are expected to have instructional experiences in which they use only rational numbers.~~	~~are stated, students are expected to have instructional experiences in which they use rational numbers including rational approximations for pi or square roots.~~	~~are stated, students are expected to have instructional experiences in which they use rational numbers including rational approximations for pi or square roots.~~	~~**and the irrational numbers.**~~ ~~a. Know that there are real numbers that are not rational numbers.~~ ~~b. Know some common examples of irrational numbers including pi or those arising from square roots.~~ ~~c. Use square roots.~~ ~~d. Be able to *estimate* the value of the square roots of whole numbers and place them on the number line.~~

~~**Real Number**~~

~~**9-Diploma Performance Indicators & Descriptors**~~

~~**1 Students know how to represent and use real numbers.**~~

~~a. Use the concept of n^{th} root.~~
~~b. *Estimate* the value(s) of roots and use technology to approximate them.~~
~~c. Compute using laws of exponents.~~
~~d. Multiply and divide numbers expressed in scientific notation.~~
~~e. *Understand* that some quadratic equations do not have real solutions and that there exist other number systems to allow for solutions to these equations.~~

~~**B. DATA: Students make measurements and collect, display, evaluate, analyze, and compute with data to describe or *model* phenomena and to make decisions based on data. Students compute statistics to summarize data sets and use concepts of probability to make predictions and describe the uncertainty inherent in data collection and measurement. It is expected that when working with measurements students:**~~

- ~~***understand* that most measurements are approximations and that taking repeated measurements reveals this variability;**~~
- ~~***understand* that a number without a *unit* is not a measurement, and that an appropriate *unit* must always be attached to a number to provide a measurement;**~~
- ~~***understand* that the *precision* and *accuracy* of a measurement depends on selecting the appropriate tools and *units*; and**~~
- ~~**use *estimation* comparing measures to *benchmarks* appropriate to the type of measure and *units*.**~~

~~**Measurement and Approximation**~~

~~**Pre-K-2 Performance Indicators & Descriptors**~~
~~**1 Students *understand* and use *units* of time, temperature, and money.**~~ ~~a. Apply and use sequences of hours in a day, days in a week, and months in a year.~~ ~~b. Tell time to the hour and half hour.~~ ~~c. Identify and give the value of different coins.~~ ~~d. Find the total value of collections of coins up to $1.00.~~ ~~e. Read temperature on thermometers with scales marked with one degree intervals.~~

~~**Measurement and Approximation**~~

~~**Performance Indicators & Descriptors**~~					
~~**3**~~	~~**4**~~	~~**5**~~	~~**6**~~	~~**7**~~	~~**8**~~
~~**1 Students *understand* and use measurement of time and temperature.**~~ ~~a. Select appropriate tools and *units* for~~	~~**1 Students *understand* and use measurement of time, capacity, and temperature.**~~ ~~a. Select appropriate tools and *units* for~~	~~**1 Students *understand* and use measures of elapsed time, temperature, capacity, mass, and use measures of mass and**~~	~~**1 Students convert within measurement systems.**~~ ~~a. *Solve* problems where different *units* are used within the~~	~~**No performance indicator.**~~ ~~Although no performance indicators are stated at this level, it is expected that students continue to use prior~~	~~**1 Students *understand* and use *derived measures* (measurements expressed as rates).**~~

~~**Performance Indicators & Descriptors**~~					
~~**3**~~	~~**4**~~	~~**5**~~	~~**6**~~	~~**7**~~	~~**8**~~
~~these measures.~~ ~~b. *Solve* and *justify* problems with these measures.~~	~~these measures.~~ ~~b. *Solve* and *justify* problems with these measures.~~	~~**weight.**~~ ~~a. Select and use appropriate tools and *units* (mass in grams, weight in pounds) for these measures.~~ ~~b. *Solve* and *justify* problems with these measures.~~	~~metric and traditional systems of measurement.~~	~~concepts and skills in new and familiar concepts.~~	~~a. Calculate measures using multiple attributes including speed (distance per time).~~ ~~b. *Solve* for an unknown component of a measure including finding time given average speed and distance.~~ ~~**2 Students convert across measurement systems and within a system for different *units* in *derived measures*.**~~ ~~a. Approximate metric and customary equivalents given a conversion factor.~~ ~~b. Convert *derived measures*, including feet per second to miles per hour.~~

~~Measurement and Approximation~~

~~9-Diploma Performance Indicators & Descriptors~~
~~1 Students *understand* the relationship between *precision* and *accuracy*.~~ ~~a. Express answers to a reasonable degree of *precision* in the context of a given problem.~~ ~~b. Represent an approximate measurement using appropriate numbers of significant figures.~~ ~~c. Know that most measurements are approximations and explain why it is useful to take the mean of repeated measurements.~~

~~Data Analysis~~

~~Pre-K-2 Performance Indicators & Descriptors~~
~~2 Students read, construct, and *interpret* picture graphs.~~

~~Data Analysis~~

~~Performance Indicators & Descriptors~~					
~~3~~	**~~4~~**	**~~5~~**	**~~6~~**	**~~7~~**	**~~8~~**
~~2 Students read, construct, and *interpret* bar graphs.~~	**~~2 Students collect and represent data in tables, line plots, and bar graphs, and read and *interpret* these types of data displays.~~**	**~~2 Students read, construct, and *interpret* line graphs.~~** **~~3 Students find and use median, mode, and range for a set of data.~~**	**~~2 Students read and *interpret* pie charts.~~** **~~3 Students find and compare the mean, median, mode, and range for sets of data.~~**	**~~1 Students use graphs and charts to represent, organize, *interpret*, and draw inferences from data.~~** ~~a. *Create* tables, pictograms, bar graphs, line graphs, pie charts, stem and leaf plots, box and whiskers plots, and histograms using pencil and paper and electronic~~	**~~3 Students use the mean, median, mode, range, and quartiles to *solve* problems involving raw data and information from data displays.~~**

~~Performance Indicators & Descriptors~~					
~~3~~	**4**	~~5~~	~~6~~	~~7~~	~~8~~
				~~technologies.~~ ~~b. Draw conclusions based on graphs and charts including tables, pictograms, bar graphs, line graphs, pie charts, stem and leaf plots, box and whiskers plots, and histograms.~~	

~~Data Analysis~~

~~9-Diploma Performance Indicators & Descriptors~~

~~2 Students *understand* correlation and cause and effect.~~

~~a. Recognize when correlation has been confused with cause and effect.~~
~~b. *Create* and *interpret* scatter plots and *estimate* correlation and lines of best fit.~~
~~c. Recognize positive and negative correlations based on data from a table or scatter plot.~~
~~d. *Estimate* the strength of correlation based upon a scatter plot.~~

~~3 Students *understand* and know how to describe distributions and find and use descriptive statistics for a set of data.~~

~~a. Find and apply range, quartiles, mean absolute deviation, and standard deviation (using technology) of a set of data.~~
~~b. *Interpret*, give examples of, and describe key differences among different types of distributions: uniform, normal, and skewed.~~
~~c. For the sample mean of normal distributions, use the standard deviation for a group of observations to establish 90%, 95%, or 99% confidence intervals.~~

~~4 Students *understand* that the purpose of random sampling is to reduce bias when creating a representative sample for a set of data.~~

~~a. Describe and account for the difference between sample statistics and statistics describing the distribution of the entire population.~~
~~b. Recognize that sample statistics produce *estimates* for the distribution of an entire population and recognize that larger sample sizes will produce more~~

~~reliable *estimates*.~~ ~~c. Apply methods of *creating* random samples and recognize possible sources of bias in samples.~~

~~**Probability**~~

~~**Pre-K-2 Performance Indicators & Descriptors**~~
~~**No performance indicator.**~~ ~~Although no performance indicators are stated, students are expected to have experiences with probability in these grades, but it is not expected that the knowledge will be secure.~~

~~**Probability**~~

~~**Performance Indicators & Descriptors**~~					
~~**3**~~	~~**4**~~	~~**5**~~	~~**6**~~	~~**7**~~	~~**8**~~
~~**No performance indicator.**~~ ~~Although no performance indicators are stated, students are expected to have experiences with probability in grade three, but it is not expected that the knowledge will be secure.~~	~~**No performance indicator.**~~ ~~Although no performance indicators are stated, students are expected to have experiences with probability in grade four, but it is not expected that the knowledge will be secure.~~	~~**No performance indicator.**~~ ~~Although no performance indicators are stated, students are expected to have experiences with probability in grade five, but it is not expected that the knowledge will be secure.~~	~~**No performance indicator.**~~ ~~Although no performance indicators are stated, students are expected to have experiences with probability in grade six, but it is not expected that the knowledge will be secure.~~	~~**2 Students *understand* and apply concepts of probability to simple events.**~~ ~~a. Describe events as likely or unlikely and discuss the concept of likelihood using such words phrases as "certain", "equally likely", and "impossible".~~ ~~b. Predict the probability of outcomes of simple experiments and verify~~	~~**4 Students *understand* and apply concepts of probability.**~~ ~~a. Use appropriate terminology to describe complementary and mutually exclusive events.~~ ~~b. Use an *understanding* of relative frequency to make and test conjectures about results of experiments and simulations.~~

~~**Performance Indicators & Descriptors**~~					
~~**3**~~	**4**	~~**5**~~	~~**6**~~	~~**7**~~	~~**8**~~
				~~predictions using the *understanding* that the probability of an occurrence is the ratio of the number of actual occurrences to the number of possible occurrences.~~ ~~c. *Interpret* probabilities between and including zero and one and explain why zero and one are the upper and lower limits for probability values.~~	~~c. Compute probabilities for compound events, using such methods as organized lists, tree diagrams, and area models.~~

~~**Probability**~~

~~**9-Diploma Performance Indicators & Descriptors**~~
~~**5 Students *understand* the relationship of probability to relative frequency and know how to find the probability of compound events.**~~ ~~a. Find the expected frequency of an event.~~ ~~b. Find the expected value of events.~~ ~~c. Find the probability of compound events including independent and dependent events.~~

~~**C. GEOMETRY: Students use measurement and observation to describe objects based on their sizes and shapes; *model* or construct two-dimensional and three-dimensional objects; *solve* problems involving geometric properties; compute areas and volumes based on object properties and**~~

~~**dimensions; and perform transformations on geometric figures. When making or calculating measures students use *estimation* to check the reasonableness of results.**~~

~~**Geometric Figures**~~

~~**Pre-K-2 Performance Indicators & Descriptors**~~
~~**1 Students recognize, *classify*, and *create* geometric figures in two and three dimensions.**~~ ~~a. Identify shapes in the physical environment.~~ ~~b. *Classify* figures as circles, triangles, and quadrilaterals by focusing on their properties.~~ ~~c. *Create* shapes by using objects to combine and *decompose* other shapes.~~

~~**Geometric Figures**~~

~~**Performance Indicators & Descriptors**~~					
~~**3**~~	~~**4**~~	~~**5**~~	~~**6**~~	~~**7**~~	~~**8**~~
~~**1 Students identify, describe, and *classify* familiar two-dimensional shapes.**~~ ~~a. Describe and *classify* two-dimensional shapes according to the number of vertices and by number, length and shape of sides.~~ ~~b. Know how to put shapes together and take them apart to form other shapes.~~ ~~c. Identify edges,~~	~~**1 Students identify and name angles, lines, relationships between lines, quadrilaterals, and triangles.**~~ ~~a. Identify perpendicular and parallel lines and sides.~~ ~~b. Identify and sketch the following quadrilaterals: rectangle, square, parallelogram, rhombus, and trapezoid.~~ ~~c. Identify and sketch the~~	~~**1 Students identify, describe, and *classify* solid figures.**~~ ~~a. Identify edges, vertices, and faces in three-dimensional figures.~~ ~~b. Describe and *classify* solid figures according to the number of edges, faces, and vertices as well as the shapes of faces.~~	~~**1 Students represent solid figures in two dimensions.**~~ ~~a. Represent cubes, prisms, and square-based or triangular-based pyramids using *nets*.~~ ~~b. Recognize and *classify* solids presented in picture views.~~ ~~c. Sketch three-dimensional figures.~~	~~**1 Students *understand* angle properties of lines in the plane.**~~ ~~a. Identify and name straight angles, angles at a point, and vertical angles and use these measures to find the measures of unknown angles.~~ ~~b. Recognize that the measures that form straight angles add to 180 degrees and the measures of~~	~~**1 Students know and use properties of polygons.**~~ ~~a. Apply the triangle inequality.~~ ~~b. Find the sum of the measures of the interior angles of a polygon.~~ ~~c. Apply the property that the sum of the measures of the exterior angles of a polygon is 360 degrees.~~ ~~**2 Students know and**~~

~~**Performance Indicators & Descriptors**~~					
~~**3**~~	~~**4**~~	~~**5**~~	~~**6**~~	~~**7**~~	~~**8**~~
~~vertices, and right angles in two-dimensional shapes.~~ ~~d. Tell whether a given angle is greater or smaller than a right angle.~~	~~following triangles: isosceles, equilateral, acute, obtuse, and right.~~			~~angles at a point add to 360 degree and apply this property to solve problems.~~ ~~c.Recognize that vertical angles are congruent and apply this property to solve problems.~~	~~**use angle properties of parallel lines to *solve* problems and determine geometric relationships.**~~ ~~a. Know and use properties of angles created when parallel lines are cut by a transversal.~~ ~~b. Use angle properties to determine whether lines are parallel.~~ ~~c.Know and use properties of angles created by parallel lines and transversals to determine the angle properties of trapezoids and parallelograms, and apply these properties in problem situations.~~ ~~**3 Students know and**~~

~~Performance Indicators & Descriptors~~					
~~3~~	~~4~~	~~5~~	~~6~~	~~7~~	~~8~~
					~~**use the Pythagorean Theorem.**~~

~~**Geometric Figures**~~

~~**9-Diploma Performance Indicators & Descriptors**~~
~~**1 Students *justify* statements about polygons and *solve* problems.**~~
~~a. Use the properties of triangles to prove theorems about figures and relationships among figures.~~ ~~b. *Solve* for missing dimensions based on congruence and similarity.~~ ~~c. Use the Pythagorean Theorem in situations where right triangles are created by adding segments to figures.~~ ~~d. Use the distance formula.~~
~~**2 Students *justify* statements about circles and *solve* problems.**~~
~~a. Use the concepts of central and inscribed angles to *solve* problems and *justify* statements.~~ ~~b. Use the relationships among arc length and circumference, and areas of circles and sectors to *solve* problems and *justify* statements.~~
~~**3 Students *understand* and use basic ideas of trigonometry.**~~
~~a. Identify and find the value of trigonometric ratios for angles in right triangles.~~ ~~b. Use trigonometry to *solve* for missing lengths in right triangles.~~ ~~c. Use inverse trigonometric functions to find missing angles in right triangles.~~

~~**Geometric Measurement**~~

~~**Pre-K-2 Performance Indicators & Descriptors**~~
~~**2 Students *understand* how to measure length and capacity and use appropriate *units*.**~~
~~a. Measure length and capacity by *direct and indirect comparison*.~~

~~b. Measure the length and capacity of objects using non-standard *units*.~~ ~~c. Measure the length of objects to whole inches and centimeters.~~

~~**Geometric Measurement**~~

~~**Performance Indicators & Descriptors**~~					
~~**3**~~	~~**4**~~	~~**5**~~	~~**6**~~	~~**7**~~	~~**8**~~
~~**2 Students *understand* how to find the distance around a figure.**~~ ~~a. Calculate and measure the distance around a figure whose perimeter is comprised of straight edges.~~	~~**2 Students *understand* the concept of area of a figure.**~~ ~~a. Find the area of shapes in non-standard *units*.~~ ~~b. Find the area of squares and other rectangles in standard *units*.~~ ~~c. Recognize and *estimate* the relative sizes of one square meter and one square centimeter and one square inch and one square foot.~~	~~**2 Students find the area of triangles and quadrilaterals.**~~ ~~a. Know how to derive and use the formula, A = (1/2) *bh* for the area of a triangle.~~ ~~b. Find the area of parallelograms.~~ ~~**3 Students *understand* how to find the volume and surface area of rectangular prisms.**~~ ~~a. Know how to build solids with unit cubes and find their volume.~~ ~~b. Recognize and *estimate* the relative sizes of one cubic meter and one cubic~~	~~**2 Students find the perimeters and areas of geometric figures.**~~ ~~a. Triangles~~ ~~b. Quadrilaterals~~ ~~c. Circles~~ ~~**3 Students find the volume and surface areas of right prisms with bases that are triangles and quadrilaterals.**~~	~~**2 Students *solve* problems involving perimeter and area.**~~ ~~a. *Solve* problems involving the area and perimeter of regions in the plane bounded by line segments and circular arcs.~~ ~~b. *Solve* problems involving the area of combined figures.~~	~~**4 Students find the volume and surface area of prisms, pyramids, cylinders, and other figures *composed* of these solids.**~~ ~~a. Apply the *understanding* that the volume of prisms and cylinders can be found by multiplying the area of a base by the height of the solid.~~ ~~b. Apply the *understanding* that the volume of pyramids can be found by multiplying the area of a base by 1/3 the height of the solid.~~ ~~c. Apply the~~

~~Performance Indicators & Descriptors~~					
~~3~~	~~4~~	~~5~~	~~6~~	~~7~~	~~8~~
		~~centimeter or one cubic inch and one cubic foot.~~ ~~c. Know how to derive and use the formula (length x width x height) for the volume of a rectangular prism.~~ ~~d. *Create nets* to aid visualization and computation.~~ ~~**4 Students *understand* how to describe position and direction in two dimensions.**~~ ~~a. Locate points on the Cartesian plane.~~ ~~b. Determine horizontal and vertical distance on the coordinate plane.~~ ~~c. Measure angles in degrees.~~			~~*understanding* that the surface area of a figure is the sum of the areas of its faces and find the surface areas of cylinders.~~

~~**Geometric Measurement**~~

~~**9-Diploma Performance Indicators & Descriptors**~~
~~**4 Students find the surface area and volume of three-dimensional objects.**~~ ~~a. Find the volume and surface area of three-dimensional figures including cones and spheres.~~ ~~b. Determine the effect of changes in linear dimensions on the volume and surface area of similar and other three-dimensional figures.~~

~~**Transformations**~~

~~**Pre-K-2 Performance Indicators & Descriptors**~~
~~**No performance indicator.**~~ ~~Although no performance indicators are stated, students are expected to have experiences with symmetry, transformations, and congruence in these grades, but it is not expected that the knowledge will be secure.~~

~~**Transformations**~~

~~**Performance Indicators & Descriptors**~~					
~~**3**~~	~~**4**~~	~~**5**~~	~~**6**~~	~~**7**~~	~~**8**~~
~~**No performance indicator.**~~ ~~Although no performance indicators are stated, students are expected to have experiences with symmetry, transformations, and congruency in grade three, but it is not expected that the knowledge will be secure.~~	~~**3 Students recognize congruent figures and line symmetry in figures.**~~ ~~a. Recognize whether a line is a line of symmetry in a figure.~~ ~~b. Recognize congruent figures.~~	~~**5 Students reflect, slide, and rotate plane figures.**~~ ~~a. Identify figures with rotational or line symmetry.~~ ~~b. *Create* figures with rotational or line symmetry.~~ ~~c. Slide, rotate, or reflect figures to create patterns or demonstrate congruence.~~	~~**4 Students *understand* and use reflections, rotations, and translations to define and identify congruent plane figures.**~~ ~~a. Apply the *understanding* that if a plane figure can be laid on top of another plane figure by rotations,~~	~~**3 Students *understand* and use the concept of scale drawings to enlarge or reduce two-dimensional plane figures.**~~ ~~a. Use the concept of scale factors when enlarging or reducing and recognize the invariance of shape.~~ ~~b. Apply the~~	~~**No performance indicator.**~~ ~~Although no performance indicators are stated, students are expected to continue to use prior concepts and skills in new and familiar contexts.~~

~~**Performance Indicators & Descriptors**~~					
~~**3**~~	~~**4**~~	~~**5**~~	~~**6**~~	~~**7**~~	~~**8**~~
			~~translations, or reflections then the figures are congruent.~~ ~~**5 Students *understand* how to use proportional relationships to make indirect linear measurements and use scale drawings to make linear measurements.**~~	~~*understanding* that enlargement or reduction by a scale factor leaves angle measures unchanged.~~ ~~c.Identify similar figures and name corresponding parts.~~	

~~**Transformations**~~

~~**9-Diploma Performance Indicators & Descriptors**~~
~~**No performance indicator.**~~ ~~Although no performance indicators are stated, students are expected to continue to use prior concepts and skills in new and familiar contexts. Methods of transformational geometry might also be used in Geometric Figures 9-Diploma Performance Indicator 1.~~

~~**D.ALGEBRA: Students use symbols to represent or *model* quantities, patterns, and relationships and use symbolic manipulation to *evaluate* expressions and *solve* equations. Students *solve* problems using symbols, tables, graphs, and verbal rules choosing the most effective representation and converting among representations.**~~

~~**Symbols and Expressions**~~

~~**Pre-K-2 Performance Indicators & Descriptors**~~
~~**1 Students *understand* how to represent quantities as simple expressions using addition and subtraction.**~~ ~~a. Show that any quantity can be represented by multiple equivalent expressions where each represents the quantity ten.~~ ~~b. Know that addition is commutative and apply this *understanding* in computation and problem-solving.~~ ~~c. Know that addition and subtraction are inverse operations and apply this *understanding* in computation and problem-solving.~~

~~**Symbols and Expressions**~~

~~**Performance Indicators & Descriptors**~~					
~~**3**~~	~~**4**~~	~~**5**~~	~~**6**~~	~~**7**~~	~~**8**~~
~~**1 Students use equivalent expressions to aid computation such as knowing that 43 + 56 is the same as 40 + 3 + 50 + 6.**~~	~~**1 Students *create* and *evaluate* simple expressions in the context of numbers and operations as described in Standard 2.1: Number * for this grade level.**~~ ~~a. *Create* and *evaluate* expressions with no more than two variables.~~ ~~* Standard 2.1 referenced here in the language of Me. Dept. of Ed. Reg. 131 refers to Standard A of this document.~~	~~**1 Students *create* and *evaluate* simple expressions in the context of numbers and operations as described in Standard 2.1: Number * for this grade level.**~~ ~~a. *Create* and *evaluate* expressions with no more than three variables.~~ ~~* Standard 2.1 referenced here in the language of Me. Dept. of Ed. Reg. 131 refers to Standard A of this document.~~	~~**1 Students *create* and *evaluate* expressions.**~~ ~~a. *Create* and *evaluate* expressions using whole numbers.~~ ~~b. *Create* and *evaluate* expressions using positive fractions including decimals.~~	~~**1 Students *create* and *evaluate* expressions.**~~ ~~a. *Create* and *evaluate* expressions using integers.~~ ~~b. *Create* and *evaluate* expressions using rational numbers.~~	~~**1 Students *create*, *evaluate*, and manipulate expressions.**~~ ~~a. Create and evaluate expressions using real numbers.~~ ~~b. Add and subtract linear expressions.~~ ~~c. Apply the properties of the real number system, including distributive and associative laws, to create equivalent expressions.~~

~~**Symbols and Expressions**~~

~~**9-Diploma Performance Indicators & Descriptors**~~
~~**1 Students *understand* and use polynomials and expressions with rational exponents.**~~ ~~a. *Simplify* expressions including those with rational exponents.~~ ~~b. Add, subtract, and multiply polynomials.~~ ~~c. Factor the common term out of polynomial expressions.~~ ~~d. Divide polynomials by (ax+b).~~

~~**Equations and Inequalities**~~

~~**Pre-K-2 Performance Indicators & Descriptors**~~
~~**2 Students *understand* that the equal sign means, "is the same as."**~~ ~~a. Identify true and false number sentences.~~ ~~b. Describe what makes number sentences true or false and apply this knowledge.~~ ~~c. Find solutions for unknowns in simple open number sentences such as 12 = 4 + [ ].~~

~~**Equations and Inequalities**~~

~~**Performance Indicators & Descriptors**~~					
~~**3**~~	~~**4**~~	~~**5**~~	~~**6**~~	~~**7**~~	~~**8**~~
~~**2 Students find the unknown in simple equations (or open sentences) in the context of numbers and operations as described in Standard 2.1: Number * for this grade level such as:**~~	~~**2 Students find the unknown in simple equations in the context of numbers and operations as described in Standard 2.1: Number * for this grade level such as:**~~ ~~**3 • b = 12**~~	~~**2 Students find the unknown in simple equations in the context of numbers and operations as described in Standard 2.1: Number * for this grade level such as:**~~ ~~**39 – k = 39 – 40**~~	~~**2 Students recognize and *solve* problems involving linear equations and recognize examples and non-examples of linear equations.**~~ ~~a. *Solve* equations of the form *ax +/- b = c* where a,~~	~~**2 Students *understand* and *solve* problems involving linear equations and know that a linear equation can be written in the form *0 = ax + b*.**~~ ~~a. *Solve* equations of the form *ax + b = c*~~	~~**2 Students *understand* and *solve* problems involving linear equations.**~~ ~~a. *Solve* any linear equation including linear equations of the form *ax + b = cx + d*.~~ ~~b. Recognize that, in~~

Performance Indicators & Descriptors					
~~3~~	4	~~5~~	~~6~~	~~7~~	~~8~~
~~3 + 5 = [ ] + 3~~ **~~3 + 9 = [ ] + 10~~** **~~[ ] + ( ) = 10.~~** ~~* Standard 2.1 referenced here in the language of Me. Dept. of Ed. Reg. 131 refers to Standard A of this document.~~	**~~3 + 4 = x + 5~~** **~~6 x 5 = 3 x [ ].~~** ~~* Standard 2.1 referenced here in the language of Me. Dept. of Ed. Reg. 131 refers to Standard A of this document.~~	**~~78 + b = 57 + 79~~** **~~30 x A = 276~~** **~~(3 + 4) x 6 = 6 x [ ]~~** **~~3x15 = 3 x (10 + [ ]).~~** ~~* Standard 2.1 referenced here in the language of Me. Dept. of Ed. Reg. 131 refers to Standard A of this document.~~	~~b, and c are whole numbers.~~ ~~b. Recognize from a table whether a relationship has a constant rate of change.~~	~~where a, b, and c are positive rational numbers or positive or negative integers.~~ ~~b. Convert equations to *0 = ax + b* form.~~	~~general, linear equations have just one solution—but know also that some linear equations can have no solution and those linear equations that are identities have every value of x as a solution.~~ ~~c. Use graphs to *estimate* solutions to equations and systems of equations, check algebraic approaches, provide alternative solution paths, and communicate the solution to a problem.~~ **~~3 Students *understand* and *solve* linear inequalities in one unknown.~~** ~~a. Represent problem~~

~~Performance Indicators & Descriptors~~					
~~3~~	~~4~~	~~5~~	~~6~~	~~7~~	~~8~~
					~~situations as inequalities.~~ ~~b.~~ *Solve* ~~linear inequalities.~~ ~~c.~~*Interpret* ~~the solutions to linear inequalities.~~

~~Equations and Inequalities~~

~~9-Diploma Performance Indicators & Descriptors~~

~~2 Students~~ *solve* ~~families of equations and inequalities.~~

~~a.~~ *Solve* ~~systems of linear equations and inequalities in two unknowns and interpret their graphs.~~
~~b.~~ *Solve* ~~quadratic equations graphically, by factoring in cases where factoring is efficient, and by applying the quadratic formula.~~
~~c.~~ *Solve* ~~simple rational equations similar to~~

$$\frac{1}{2x+1} = 5 \ .$$

~~d.~~ *Solve* ~~absolute value equations and inequalities and interpret the results.~~
~~e. Apply the~~ *understanding* ~~that the solution(s) to equations of the form~~ $f(x) = g(x)$ ~~are the~~ x ~~-value(s) of the point(s) of intersection of the graphs of~~ $f(x)$ ~~and~~ $g(x)$ ~~and common outputs in table of values.~~
~~f. Explain why the coordinates of the point of intersection of the lines represented by a system of equations is its solution and apply this~~ *understanding* ~~to solving problems.~~

~~3 Students~~ *understand* ~~and apply ideas of logarithms.~~

~~a. Use and~~ *interpret* ~~logarithmic scales.~~
~~b.~~ *Solve* ~~equations in the form of~~ $x = b^y$ ~~using the equivalent form~~ $y = \log_b x$.

~~**Functions and Relations**~~

~~**Pre-K-2 Performance Indicators & Descriptors**~~
~~**3 Students *understand* how to *create*, identify, describe, and extend patterns given a pattern or a rule.**~~ ~~a. Describe, extend, and *create* repeating patterns.~~ ~~b. Describe, extend, and *create* growing patterns.~~

~~**Functions and Relations**~~

~~**Performance Indicators & Descriptors**~~					
~~**3**~~	~~**4**~~	~~**5**~~	~~**6**~~	~~**7**~~	~~**8**~~
~~**3 Students *understand* arithmetic relationships among positive whole numbers.**~~ ~~a. Use the inverse relationships between addition and subtraction and between multiplication and division and the commutative laws of multiplication and addition to *solve* problems.~~ ~~b. Be able to show that for whole numbers subtraction and division are not commutative and~~	~~**3 Students use tables, rules, diagrams, and patterns to represent the relationship between quantities and to extend sequences.**~~	~~**3 Students use tables, rules, diagrams, and graphs to represent and analyze the relationship between quantities.**~~	~~**3 Students use tables, formulas, diagrams, and graphs to analyze relationships between quantities.**~~ ~~a. Use tables, formulas, and graphs to analyze constant difference (additive) relationships.~~ ~~b. Use tables, formulas, and graphs to analyze constant ratio (multiplicative) relationships.~~	~~**3 Students *understand* and use directly proportional relationships, *y* = *kx*.**~~ ~~a. Recognize directly proportional relationships by information in a table, graph, or formula.~~ ~~b. Translate common directly proportional relationships into symbolic statements and graphs.~~ ~~c. *Interpret* the slope and y-intercept of the graph of y = *kx* in terms of a given context.~~	~~**4 Students *understand* and use the basic properties of linear relationships, *y* = kx + *b*.**~~ ~~a. *Understand* that linear relationships are characterized by a constant rate of change, *k*.~~ ~~b. *Understand* that the graph of a linear relationship y = *kx* + *b* is a line where the slope is *k* and *b* is the y-coordinate of the point where the graph crosses the y-axis (i.e., value of y when *x* = 0).~~ ~~c. Translate common~~

~~Performance Indicators & Descriptors~~					
~~3~~	~~4~~	~~5~~	~~6~~	~~7~~	~~8~~
~~show that multiplication and addition are commutative.~~ **~~4 Students *create*, describe, explain and extend patterns with numbers and geometric objects.~~**					~~linear phenomena into symbolic statements and graphs, and interpret the slope and y-intercept of the graph of *y = kx + b* in terms of the original situation.~~

~~Functions and Relations~~

~~9-Diploma Performance Indicators & Descriptors~~
~~4 Students *understand* and *interpret* the characteristics of functions using graphs, tables, and algebraic techniques.~~ ~~a. Recognize the graphs and sketch graphs of the basic functions~~ $\cancel{f(x) = x^n}$, ~~*where n = 1 to 3;*~~ $\cancel{f(x) = ax^2 + bx + c}$; $\cancel{f(x) = \sqrt{x}}$; $\cancel{f(x) = \lvert x \rvert}$; $\cancel{f(x) = \frac{a}{x}}$; $\cancel{f(x) = a^x}$; ~~*and*~~ $\cancel{f(x) = kx + b}$ ~~b. Apply functions from these families to problem situations.~~ ~~c. Use concepts such as domain, range, zeros, intercepts, and maximum and minimum values.~~ ~~d. Use the concepts of average rate of change (table of values) and increasing and decreasing over intervals, and use these characteristics to compare~~

~~functions.~~

~~5 Students express relationships *recursively* and use *iterative* methods to *solve* problems.~~

a. ~~Express the (n+1) st term in terms of the nth term and describe relationships in terms of a starting point and rule followed to transform one term to the next.~~
b. ~~Use technology to perform repeated calculations to develop solutions to real life problems involving linear, exponential, and other patterns of change.~~

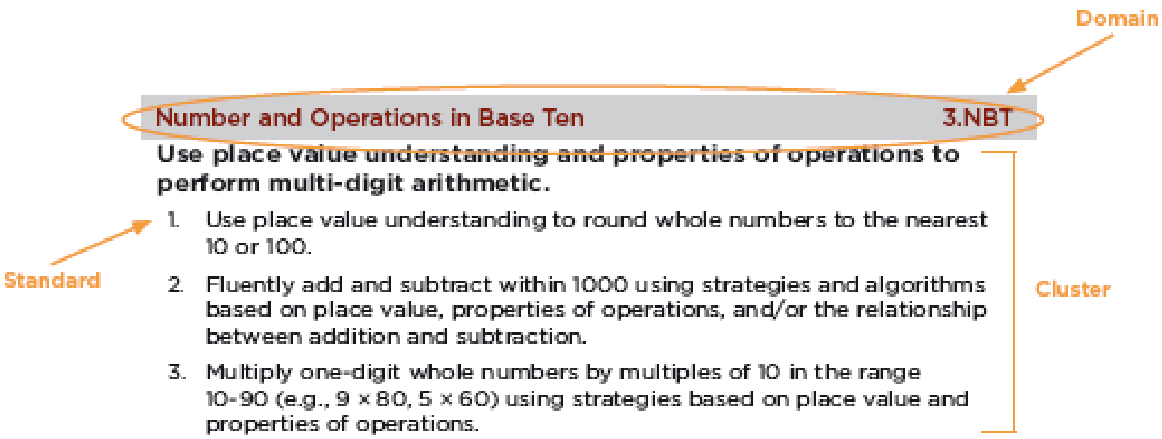
Mathematics

How to read the grade level standards

Standards define what students should understand and be able to do.

Clusters summarize groups of related standards. Note that standards from different clusters may sometimes be closely related, because mathematics is a connected subject.

Domains are larger groups of related standards. Standards from different domains may sometimes be closely related.



These Standards do not dictate curriculum or teaching methods. For example, just because topic A appears before topic B in the standards for a given grade, it does not necessarily mean that topic A must be taught before topic B. A teacher might prefer to teach topic B before topic A, or might choose to highlight connections by teaching topic A and topic B at the same time. Or, a teacher might prefer to teach a topic of his or her own choosing that leads, as a byproduct, to students reaching the standards for topics A and B.

What students can learn at any particular grade level depends upon what they have learned before. Ideally then, each standard in this document might have been phrased in the form, “Students who already know A should next come to learn B.” But at present this approach is unrealistic—not least because existing education research cannot specify all such learning pathways. Of necessity therefore, grade placements for specific topics have been made on the basis of state and international comparisons and the collective experience and collective professional judgment of educators, researchers and mathematicians. One promise of common state standards is that over time they will allow research on learning progressions to inform and improve the design of standards to a much greater extent than is possible today. Learning opportunities will continue to vary across schools and school systems, and educators should make every effort to meet the needs of individual students based on their current understanding.

These Standards are not intended to be new names for old ways of doing business. They are a call to take the next step. It is time for states to work together to build on lessons learned from two decades of standards based reforms. It is time to recognize that these standards are not just promises to our children, but promises we intend to keep.

Mathematics: Standards for Mathematical Practice

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important “processes and proficiencies” with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council’s report *Adding It Up*: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one’s own efficacy).

1. Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

2. Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to *decontextualize*—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to *contextualize*, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

3. Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

4. Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

5. Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

6. Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

7. Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 – 3(x – y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

8. Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y – 2)/(x – 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x – 1)(x + 1)$, $(x – 1)(x^2 + x + 1)$, and $(x – 1)(x^3 + x2 + x + 1)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Connecting the Standards for Mathematical Practice to the Standards for Mathematical Content

The Standards for Mathematical Practice describe ways in which developing student practitioners of the discipline of mathematics increasingly ought to engage with the subject matter as they grow in mathematical maturity and expertise throughout the elementary, middle and high school years. Designers of curricula, assessments, and professional development should all attend to the need to connect the mathematical practices to mathematical content in mathematics instruction.

The Standards for Mathematical Content are a balanced combination of procedure and understanding. Expectations that begin with the word “understand” are often especially good opportunities to connect the practices to the content. Students who lack understanding of a topic may rely on procedures too heavily. Without a flexible base from which to work, they may be less likely to consider analogous problems, represent problems coherently, justify conclusions, apply the mathematics to practical situations, use technology mindfully to work with the mathematics, explain the mathematics accurately to other students, step back for an overview, or deviate from a known procedure to find a shortcut. In short, a lack of understanding effectively prevents a student from engaging in the mathematical practices.

In this respect, those content standards which set an expectation of understanding are potential “points of intersection” between the Standards for Mathematical Content and the Standards for Mathematical Practice. These points of intersection are intended to be weighted toward central and generative concepts in the school mathematics curriculum that most merit the time, resources, innovative energies, and focus necessary to qualitatively improve the curriculum, instruction, assessment, professional development, and student achievement in mathematics.

Mathematics – Kindergarten: Introduction

In Kindergarten, instructional time should focus on two critical areas: (1) representing and comparing whole numbers, initially with sets of objects; (2) describing shapes and space. More learning time in Kindergarten should be devoted to number than to other topics.

1. Students use numbers, including written numerals, to represent quantities and to solve quantitative problems, such as counting objects in a set; counting out a given number of objects; comparing sets or numerals; and modeling simple joining and separating situations with sets of objects, or eventually with equations such as 5 + 2 = 7 and 7 – 2 = 5. (Kindergarten students should see addition and subtraction equations, and student writing of equations in kindergarten is encouraged, but it is not required.) Students choose, combine, and apply effective strategies for answering quantitative questions, including quickly recognizing the cardinalities of small sets of objects, counting and producing sets of given sizes, counting the number of objects in combined sets, or counting the number of objects that remain in a set after some are taken away.

2. Students describe their physical world using geometric ideas (e.g., shape, orientation, spatial relations) and vocabulary. They identify, name, and describe basic two-dimensional shapes, such as squares, triangles, circles, rectangles, and hexagons, presented in a variety of ways (e.g., with different sizes and orientations), as well as three-dimensional shapes such as cubes, cones, cylinders, and spheres. They use basic shapes and spatial reasoning to model objects in their environment and to construct more complex shapes.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Grade K Overview

Counting and Cardinality

- Know number names and the count sequence.
- Count to tell the number of objects.
- Compare numbers.

Measurement and Data

- Describe and compare measurable attributes.
- Classify objects and count the number of objects in categories.

Operations and Algebraic Thinking

• Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

Number and Operations in Base Ten

• Work with numbers 11–19 to gain foundations for place value.

Geometry

• Identify and describe shapes.

• Analyze, compare, create, and compose shapes.

Counting & Cardinality K.CC

Know number names and the count sequence.

1. Count to 100 by ones and by tens.
2. Count forward beginning from a given number within the known sequence (instead of having to begin at 1).
3. Write numbers from 0 to 20. Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects).

Count to tell the number of objects.

4. Understand the relationship between numbers and quantities; connect counting to cardinality.
   a. When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object.
   b. Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted.
   c. Understand that each successive number name refers to a quantity that is one larger.

Develop understanding of ordinal numbers (first through tenth) to describe the relative position and magnitude of whole numbers.

5. Count to answer "how many?" questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1–20, count out that many objects.

Compare numbers.

6. Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies.[1]

7. Compare two numbers between 1 and 10 presented as written numerals.

[1] Include groups with up to ten objects.

Operations & Algebraic Thinking K.OA

Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

1. Represent addition and subtraction with objects, fingers, mental images, drawings[1], sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.

2. Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.

3. Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (e.g., 5 = 2 + 3 and 5 = 4 + 1).

4. For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation.

5. Fluently add and subtract within 5.

[1] Drawings need not show details, but should show the mathematics in the problem. (This applies wherever drawings are mentioned in the Standards.)

Number & Operations in Base Ten K.NBT

Work with numbers 11-19 to gain foundations for place value.

1. Compose and decompose numbers from 11 to 19 into ten ones and some further ones, e.g., by using objects or drawings, and record each composition or decomposition by a drawing or equation (such as 18 = 10 + 8); understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones.

Measurement & Data	K.MD

Describe and compare measurable attributes.

1. Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.

2. Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. *For example, directly compare the heights of two children and describe one child as taller/shorter.*

Classify objects and count the number of objects in each category.

3. Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.[1]

[1] Limit category counts to be less than or equal to 10.

Geometry	K.G

Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres).

1. Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as *above*, *below*, *beside*, *in front of*, *behind*, and *next to*.

2. Correctly name shapes regardless of their orientations or overall size.

3. Identify shapes as two-dimensional (lying in a plane, "flat") or three-dimensional ("solid").

Analyze, compare, create, and compose shapes.

4. Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/"corners") and other attributes (e.g., having sides of equal length).

5. Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes.

6. Compose simple shapes to form larger shapes. *For example, "Can you join these two triangles with full sides touching to make a rectangle?"*

Mathematics - Grade 1: Introduction

In Grade 1, instructional time should focus on four critical areas: (1) developing understanding of addition, subtraction, and strategies for addition and subtraction within 20; (2) developing understanding of whole number relationships and place value, including grouping in tens and ones; (3) developing understanding of linear measurement and measuring lengths as iterating length units; and (4) reasoning about attributes of, and composing and decomposing geometric shapes.

1. Students develop strategies for adding and subtracting whole numbers based on their prior work with small numbers. They use a variety of models, including discrete objects and length-based models (e.g., cubes connected to form lengths), to model add-to, take-from, put-together, take-apart, and compare situations to develop meaning for the operations of addition and subtraction, and to develop strategies to solve arithmetic problems with these operations. Students understand connections between counting and addition and subtraction (e.g., adding two is the same as counting on two). They use properties of addition to add whole numbers and to create and use increasingly sophisticated strategies based on these properties (e.g., “making tens”) to solve addition and subtraction problems within 20. By comparing a variety of solution strategies, children build their understanding of the relationship between addition and subtraction.

2. Students develop, discuss, and use efficient, accurate, and generalizable methods to add within 100 and subtract multiples of 10. They compare whole numbers (at least to 100) to develop understanding of and solve problems involving their relative sizes. They think of whole numbers between 10 and 100 in terms of tens and ones (especially recognizing the numbers 11 to 19 as composed of a ten and some ones). Through activities that build number sense, they understand the order of the counting numbers and their relative magnitudes.

3. Students develop an understanding of the meaning and processes of measurement, including underlying concepts such as iterating (the mental activity of building up the length of an object with equal-sized units) and the transitivity principle for indirect measurement.[1]

4. Students compose and decompose plane or solid figures (e.g., put two triangles together to make a quadrilateral) and build understanding of part-whole relationships as well as the properties of the original and composite shapes. As they combine shapes, they recognize them from different perspectives and orientations, describe their geometric attributes, and determine how they are alike and different, to develop the background for measurement and for initial understandings of properties such as congruence and symmetry.

[1] Students should apply the principle of transitivity of measurement to make indirect comparisons, but they need not use this technical term.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Grade 1 Overview

Operations and Algebraic Thinking

- Represent and solve problems involving addition and subtraction.
- Understand and apply properties of operations and the relationship between addition and subtraction.
- Add and subtract within 20.
- Work with addition and subtraction equations.

Number and Operations in Base Ten

- Extend the counting sequence.

Measurement and Data

- Measure lengths indirectly and by iterating length units.
- Tell and write time.
- Represent and interpret data.

Geometry

- Reason with shapes and their attributes.

• Understand place value.

• Use place value understanding and properties of operations to add and subtract.

Operations & Algebraic Thinking 1.OA

Represent and solve problems involving addition and subtraction.

1. Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.[1]

2. Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.

Understand and apply properties of operations and the relationship between addition and subtraction.

3. Apply properties of operations as strategies to add and subtract.[2] *Examples: If 8 + 3 = 11 is known, then 3 + 8 = 11 is also known. (Commutative property of addition.) To add 2 + 6 + 4, the second two numbers can be added to make a ten, so 2 + 6 + 4 = 2 + 10 = 12. (Associative property of addition.)*

4. Understand subtraction as an unknown-addend problem. *For example, subtract 10 – 8 by finding the number that makes 10 when added to 8. Add and subtract within 20.*

Add and subtract within 20.

5. Relate counting to addition and subtraction (e.g., by counting on 2 to add 2).

6. Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. Use strategies such as counting on; making ten (e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14); decomposing a number leading to a ten (e.g., 13 – 4 = 13 – 3 – 1 = 10 – 1 = 9); using the relationship between addition and subtraction (e.g., knowing that 8 + 4 = 12, one knows 12 – 8 = 4); and creating equivalent but easier or known sums (e.g., adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13).

Work with addition and subtraction equations.

7. Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false. For example, which of the following equations are true and which are false? 6 = 6, 7 = 8 – 1, 5 + 2 = 2 + 5, 4 + 1 = 5 + 2.

8. Determine the unknown whole number in an addition or subtraction equation relating three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations 8 + ? = 11, 5 = _ – 3, 6 + 6 = _.*

[1] See Glossary, Table 1.

[2] Students need not use formal terms for these properties.

Number & Operations in Base Ten 1.NBT

Extend the counting sequence.

1. Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral.

Understand place value.

2. Understand that the two digits of a two-digit number represent amounts of tens and ones. Understand the following as special cases:

   a. 10 can be thought of as a bundle of ten ones — called a “ten.”
   b. The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones.
   c. The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones).

3. Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols >, =, and <.

Use place value understanding and properties of operations to add and subtract.

4. Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten.

5. Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.

6. Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range 10-90 (positive or zero differences), using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

Measurement & Data 1.MD

Measure lengths indirectly and by iterating length units.

1. Order three objects by length; compare the lengths of two objects indirectly by using a third object.

2. Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. *Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps.*

Tell and write time *and money*.

3.Tell and write time in hours and half-hours using analog and digital clocks.

Recognize and identify coins, their names, and their value.

Represent and interpret data.

4. Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.

Geometry 1.G

Reason with shapes and their attributes.

1. Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size) ; build and draw shapes to possess defining attributes.

2. Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape.[1]

3. Partition circles and rectangles into two and four equal shares, describe the shares using the words *halves*, *fourths*, and *quarters*, and use the phrases *half of*, *fourth of*, and *quarter of*. Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares.

[1] Students do not need to learn formal names such as “right rectangular prism.”

Mathematics - Grade 2: Introduction

In Grade 2, instructional time should focus on four critical areas: (1) extending understanding of base-ten notation; (2) building fluency with addition and subtraction; (3) using standard units of measure; and (4) describing and analyzing shapes.

1. Students extend their understanding of the base-ten system. This includes ideas of counting in fives, tens, and multiples of hundreds, tens, and ones, as well as number relationships involving these units, including comparing. Students understand multi-digit numbers (up to 1000) written in base-ten notation, recognizing that the digits in each place represent amounts of thousands, hundreds, tens, or ones (e.g., 853 is 8 hundreds + 5 tens + 3 ones).

2. Students use their understanding of addition to develop fluency with addition and subtraction within 100. They solve problems within 1000 by applying their understanding of models for addition and subtraction, and they develop, discuss, and use efficient, accurate, and generalizable methods to compute sums and differences of whole numbers in base-ten notation, using their understanding of place value and the properties of operations. They select and accurately apply methods that are appropriate for the context and the numbers involved to mentally calculate sums and differences for numbers with only tens or only hundreds.

3. Students recognize the need for standard units of measure (centimeter and inch) and they use rulers and other measurement tools with the understanding that linear measure involves an iteration of units. They recognize that the smaller the unit, the more iterations they need to cover a given length.

4. Students describe and analyze shapes by examining their sides and angles. Students investigate, describe, and reason about decomposing and combining shapes to make other shapes. Through building, drawing, and analyzing two- and three-dimensional shapes, students develop a foundation for understanding area, volume, congruence, similarity, and symmetry in later grades.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Grade 2 Overview

Operations and Algebraic Thinking

- Represent and solve problems involving addition and subtraction.
- Add and subtract within 20.
- Work with equal groups of objects to gain foundations for multiplication.

Number and Operations in Base Ten

- Understand place value.
- Use place value understanding and properties of operations to add and subtract.

Measurement and Data

- Measure and estimate lengths in standard units.
- Relate addition and subtraction to length.
- Work with time and money.
- Represent and interpret data.

Geometry

- Reason with shapes and their attributes.

Operations & Algebraic Thinking 2.OA

Represent and solve problems involving addition and subtraction.

1. Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.[1]

Add and subtract within 20.

2. Fluently add and subtract within 20 using mental strategies.[2] By end of Grade 2, know from memory all sums of two one-digit numbers.

Work with equal groups of objects to gain foundations for multiplication.

3. Determine whether a group of objects (up to 20) has an odd or even number of members, e.g., by pairing objects or counting them by 2s; write an equation to express an even number as a sum of two equal addends.

4. Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends.

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[1] See Glossary, Table 1.

[2] See standard 1.OA.6 for a list of mental strategies.

Number & Operations in Base Ten 2.NBT

Understand place value.

1. Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones; e.g., 706 equals 7 hundreds, 0 tens, and 6 ones. Understand the following as special cases:

   a. 100 can be thought of as a bundle of ten tens — called a “hundred.”
   b. The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones).

2. Count within 1000; skip-count by 5s, 10s, and 100s.

3. Read and write numbers to 1000 using base-ten numerals, number names, and expanded form.

4. Compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits, using >, =, and < symbols to record the results of comparisons.

Use place value understanding and properties of operations to add and subtract.

5. Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.

6. Add up to four two-digit numbers using strategies based on place value and properties of operations.

7. Add and subtract within 1000, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method. Understand that in adding or subtracting three-digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones; and sometimes it is necessary to compose or decompose tens or hundreds.

8. Mentally add 10 or 100 to a given number 100–900, and mentally subtract 10 or 100 from a given number 100–900.

9. Explain why addition and subtraction strategies work, using place value and the properties of operations.[1]

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[1] Explanations may be supported by drawings or objects.

Measurement & Data 2.MD

Measure and estimate lengths in standard units.

1. Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

2. Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen.

3. Estimate lengths using units of inches, feet, centimeters, and meters.

4. Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.

Relate addition and subtraction to length.

5. Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem.

6. Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, ..., and represent whole-number sums and differences within 100 on a number line diagram.

Work with time and money.

7. Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.

8. Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using $ and ¢ symbols appropriately. Example: If you have 2 dimes and 3 pennies, how many cents do you have?

Represent and interpret data.

9. Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Show the measurements by making a line plot, where the horizontal scale is marked off in whole-number units.

10. Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems[1] using information presented in a bar graph.

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[1] See Glossary, Table 1.

Geometry 2.G

Reason with shapes and their attributes.

1. Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces.[1] Identify triangles, quadrilaterals, pentagons, hexagons, and cubes.

2. Partition a rectangle into rows and columns of same-size squares and count to find the total number of them.

3. Partition circles and rectangles into two, three, or four equal shares, describe the shares using the words halves, thirds, half of, a third of, etc., and describe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape.

[1] Sizes are compared directly or visually, not compared by measuring.

Mathematics - Grade 3: Introduction

In Grade 3, instructional time should focus on four critical areas: (1) developing understanding of multiplication and division and strategies for multiplication and division within 100; (2) developing understanding of fractions, especially unit fractions (fractions with numerator 1); (3) developing understanding of the structure of rectangular arrays and of area; and (4) describing and analyzing two-dimensional shapes.

1. Students develop an understanding of the meanings of multiplication and division of whole numbers through activities and problems involving equal-sized groups, arrays, and area models; multiplication is finding an unknown product, and division is finding an unknown factor in these situations. For equal-sized group situations, division can require finding the unknown number of groups or the unknown group size. Students use properties of operations to calculate products of whole numbers, using increasingly sophisticated strategies based on these properties to solve multiplication and division problems involving single-digit factors. By comparing a variety of solution strategies, students learn the relationship between multiplication and division.

2. Students develop an understanding of fractions, beginning with unit fractions. Students view fractions in general as being built out of unit fractions, and they use fractions along with visual fraction models to represent parts of a whole. Students understand that the size of a fractional part is relative to the size of the whole. For example, 1/2 of the paint in a small bucket could be less paint than 1/3 of the paint in a larger bucket, but 1/3 of a ribbon is longer than 1/5 of the same ribbon because when the ribbon is divided into 3 equal parts, the parts are longer than when the ribbon is divided into 5 equal parts. Students are able to use fractions to represent numbers equal to, less than, and greater than one. They solve problems that involve comparing fractions by using visual fraction models and strategies based on noticing equal numerators or denominators.

3. Students recognize area as an attribute of two-dimensional regions. They measure the area of a shape by finding the total number of same-size units of area required to cover the shape without gaps or overlaps, a square with sides of unit length being the standard unit for measuring area. Students understand that rectangular arrays can be decomposed into identical rows or into identical columns. By decomposing rectangles into rectangular arrays of squares, students connect area to multiplication, and justify using multiplication to determine the area of a rectangle.

4. Students describe, analyze, and compare properties of two-dimensional shapes. They compare and classify shapes by their sides and angles, and connect these with definitions of shapes. Students also relate their fraction work to geometry by expressing the area of part of a shape as a unit fraction of the whole.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated

reasoning.

Grade 3 Overview

Operations and Algebraic Thinking

• Represent and solve problems involving multiplication and division.

• Understand properties of multiplication and the relationship between multiplication and division.

• Multiply and divide within 100.

• Solve problems involving the four operations, and identify and explain patterns in arithmetic.

Number and Operations in Base Ten

• Use place value understanding and properties of operations to perform multi-digit arithmetic.

Number and Operations—Fractions

• Develop understanding of fractions as numbers.

Measurement and Data

• Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.

• Represent and interpret data.

• Geometric measurement: understand concepts of area and relate area to multiplication and to addition.

• Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.

Geometry

• Reason with shapes and their attributes.

Operations & Algebraic Thinking 3.OA

Represent and solve problems involving multiplication and division.

1. Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each. *For example, describe a context in which a total number of objects can be expressed as 5 × 7.*

2. Interpret whole-number quotients of whole numbers, e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. *For example, describe a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8.*

3. Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.[1]

4. Determine the unknown whole number in a multiplication or division equation relating three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations 8 × ? = 48, 5 = _ ÷ 3, 6 × 6 = ?*

Understand properties of multiplication and the relationship between multiplication and division.

5. Apply properties of operations as strategies to multiply and divide.[2] *Examples: If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known. (Commutative property of multiplication.) 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30. (Associative property of multiplication.) Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56. (Distributive property.)*

6. Understand division as an unknown-factor problem. *For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8.*

Multiply and divide within 100.

7. Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.

Solve problems involving the four operations, and identify and explain patterns in arithmetic.

8. Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.[3]

9. Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. *For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.*

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[1] See Glossary, Table 2.

[2] Students need not use formal terms for these properties.

[3] This standard is limited to problems posed with whole numbers and having whole-number answers; students should know how to perform operations in the conventional order when there are no parentheses to specify a particular order.

Number & Operations in Base Ten 3.NBT

Use place value understanding and properties of operations to perform multi-digit arithmetic.[1]

1. Use place value understanding to round whole numbers to the nearest 10 or 100.

2. Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

3. Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations.

[1] A range of algorithms may be used.

Number & Operations—Fractions[1] 3.NF

Develop understanding of fractions as numbers.

1. Understand a fraction 1/*b* as the quantity formed by 1 part when *a* whole is partitioned into *b* equal parts; understand a fraction *a*/*b* as the quantity formed by a parts of size 1/*b*.

2. Understand a fraction as a number on the number line; represent fractions on a number line diagram.

   a. Represent a fraction 1/*b* on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into *b* equal parts. Recognize that each part has size 1/*b* and that the endpoint of the part based at 0 locates the number 1/*b* on the number line.
   b. Represent a fraction *a*/*b* on a number line diagram by marking off a lengths 1/*b* from 0. Recognize that the resulting interval has size *a*/*b* and that its endpoint locates the number *a*/*b* on the number line.

3. Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.

   a. Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line.

b. Recognize and generate simple equivalent fractions, e.g., 1/2 = 2/4, 4/6 = 2/3). Explain why the fractions are equivalent, e.g., by using a visual fraction model.

c. Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. *Examples: Express 3 in the form 3 = 3/1; recognize that 6/1 = 6; locate 4/4 and 1 at the same point of a number line diagram.*

d. Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.

[1] Grade 3 expectations in this domain are limited to fractions with denominators 2, 3, 4, 6, 8.

Measurement & Data 3.MD

Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.

1. Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.

2. Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l).[1] Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.[2]

Represent and interpret data.

3. Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.*

4. Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units— whole numbers, halves, or quarters.

Geometric measurement: understand concepts of area and relate area to multiplication and to addition.

5. Recognize area as an attribute of plane figures and understand concepts of area measurement.

a. A square with side length 1 unit, called “a unit square,” is said to have “one square unit” of area, and can be used to measure area.

b. A plane figure which can be covered without gaps or overlaps by *n* unit squares is said to have an area of *n* square units.

6. Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).

7. Relate area to the operations of multiplication and addition.

a. Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths.
b. Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning.
c. Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and $b + c$ is the sum of $a \times b$ and $a \times c$. Use area models to represent the distributive property in mathematical reasoning.
d. Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems.

Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.

8. Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

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[1] Excludes compound units such as cm3 and finding the geometric volume of a container.

[2] Excludes multiplicative comparison problems (problems involving notions of “times as much”; see Glossary, Table 2).

Geometry 3.G

Reason with shapes and their attributes.

1. Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.

2. Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.*

Mathematics - Grade 4: Introduction

In Grade 4, instructional time should focus on three critical areas: (1) developing understanding and fluency with multi-digit multiplication, and developing understanding of dividing to find quotients involving multi-digit dividends; (2) developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers; (3) understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.

1. Students generalize their understanding of place value to 1,000,000, understanding the relative sizes of numbers in each place. They apply their understanding of models for multiplication (equal-sized groups, arrays, area models), place value, and properties of operations, in particular the distributive property, as they develop, discuss, and use efficient, accurate, and generalizable methods to compute products of multi-digit whole numbers. Depending on the numbers and the context, they select and accurately apply appropriate methods to estimate or mentally calculate products. They develop fluency with efficient procedures for multiplying whole numbers; understand and explain why the procedures work based on place value and properties of operations; and use them to solve problems. Students apply their understanding of models for division, place value, properties of operations, and the relationship of division to multiplication as they develop, discuss, and use efficient, accurate, and generalizable procedures to find quotients involving multi-digit dividends. They select and accurately apply appropriate methods to estimate and mentally calculate quotients, and interpret remainders based upon the context.

2. Students develop understanding of fraction equivalence and operations with fractions. They recognize that two different fractions can be equal (e.g., 15/9 = 5/3), and they develop methods for generating and recognizing equivalent fractions. Students extend previous understandings about how fractions are built from unit fractions, composing fractions from unit fractions, decomposing fractions into unit fractions, and using the meaning of fractions and the meaning of multiplication to multiply a fraction by a whole number.

3. Students describe, analyze, compare, and classify two-dimensional shapes. Through building, drawing, and analyzing two-dimensional shapes, students deepen their understanding of properties of two-dimensional objects and the use of them to solve problems involving symmetry.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Grade 4 Overview

Operations and Algebraic Thinking

• Use the four operations with whole numbers to solve problems.

• Gain familiarity with factors and multiples.

• Generate and analyze patterns.

Number and Operations in Base Ten

• Generalize place value understanding for multidigit whole numbers.

• Use place value understanding and properties of operations to perform multi-digit arithmetic.

Number and Operations—Fractions

• Extend understanding of fraction equivalence and ordering.

• Build fractions from unit fractions by applying and extending previous understandings of

Measurement and Data

• Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

• Represent and interpret data.

• Geometric measurement: understand concepts of angle and measure angles.

Geometry

• Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

operations on whole numbers.

• Understand decimal notation for fractions, and

compare decimal fractions.

Operations & Algebraic Thinking 4.OA

Use the four operations with whole numbers to solve problems.

1. Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.

2. Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.[1]

3. Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

Gain familiarity with factors and multiples.

4. Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite.

Generate and analyze patterns.

5. Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. *For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.*

[1] See Glossary, Table 2.

Number & Operations in Base Ten[1] 4.NBT

Generalize place value understanding for multi-digit whole numbers.

1. Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. *For example, recognize that 700 ÷ 70 = 10 by applying concepts of place value and division.*

2. Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

3. Use place value understanding to round multi-digit whole numbers to any place.

Use place value understanding and properties of operations to perform multi-digit arithmetic.

4. Fluently add and subtract multi-digit whole numbers using the standard algorithm.

5. Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

6. Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

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[1]Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000

Number & Operations—Fractions[1] **4.NF**

Extend understanding of fraction equivalence and ordering.

1. Explain why a fraction *a*/*b* is equivalent to a fraction (*n* × *a*)/(*n* × *b*) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.

2. Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.

Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.

3. Understand a fraction *a*/*b* with *a* > 1 as a sum of fractions 1/*b*.

   a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.
   b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. *Examples: 3/8 = 1/8 + 1/8 + 1/8 ; 3/8 = 1/8 + 2/8 ; 2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8.*

c. Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.

d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.

4. Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.

a. Understand a fraction *a*/*b* as a multiple of 1/*b*. *For example, use a visual fraction model to represent 5/4 as the product 5 × (1/4), recording the conclusion by the equation 5/4 = 5 × (1/4).*

b. Understand a multiple of a/b as a multiple of 1/b, and use this understanding to multiply a fraction by a whole number. *For example, use a visual fraction model to express 3 × (2/5) as 6 × (1/5), recognizing this product as 6/5. (In general, n × (a/b) = (n × a)/b.)*

c. Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. *For example, if each person at a party will eat 3/8 of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?*

Understand decimal notation for fractions, and compare decimal fractions.

5. Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100.[2] *For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.*

6. Use decimal notation for fractions with denominators 10 or 100. *For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.*

7. Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model.

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[1] Grade 4 expectations in this domain are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, 100.

[2] Students who can generate equivalent fractions can develop strategies for adding fractions with unlike denominators in general. But addition and subtraction with unlike denominators in general is not a requirement at this grade.

Measurement & Data 4.MD

Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

1. Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. *For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), ...*

2. Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

3. Apply the area and perimeter formulas for rectangles in real world and mathematical problems. *For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.*

Represent and interpret data.

4. Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots. *For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.*

Geometric measurement: understand concepts of angle and measure angles.

5. Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement:

a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of a circle is called a "one-degree angle," and can be used to measure angles.

b. An angle that turns through *n* one-degree angles is said to have an angle measure of *n* degrees.

6. Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.

7. Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure.

Geometry 4.G

Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

1. Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

2. Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.

3. Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.

Mathematics - Grade 5: Introduction

In Grade 5, instructional time should focus on three critical areas: (1) developing fluency with addition and subtraction of fractions, and developing understanding of the multiplication of fractions and of division of fractions in limited cases (unit fractions divided by whole numbers and whole numbers divided by unit fractions); (2) extending division to 2-digit divisors, integrating decimal fractions into the place value system and developing understanding of operations with decimals to hundredths, and developing fluency with whole number and decimal operations; and (3) developing understanding of volume.

1. Students apply their understanding of fractions and fraction models to represent the addition and subtraction of fractions with unlike denominators as equivalent calculations with like denominators. They develop fluency in calculating sums and differences of fractions, and make reasonable estimates of them. Students also use the meaning of fractions, of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for multiplying and dividing fractions make sense. (Note: this is limited to the case of dividing unit fractions by whole numbers and whole numbers by unit fractions.)

2. Students develop understanding of why division procedures work based on the meaning of base-ten numerals and properties of operations. They finalize fluency with multi-digit addition, subtraction, multiplication, and division. They apply their understandings of models for decimals, decimal notation, and properties of operations to add and subtract decimals to hundredths. They develop fluency in these computations, and make reasonable estimates of their results. Students use the relationship between decimals and fractions, as well as the relationship between finite decimals and whole numbers (i.e., a finite decimal multiplied by an appropriate power of 10 is a whole number), to understand and explain why the procedures for multiplying and dividing finite decimals make sense. They compute products and quotients of decimals to hundredths efficiently and accurately.

3. Students recognize volume as an attribute of three-dimensional space. They understand that volume can be measured by finding the total number of same-size units of volume required to fill the space without gaps or overlaps. They understand that a 1-unit by 1-unit by 1-unit cube is the standard unit for measuring volume. They select appropriate units, strategies, and tools for solving problems that involve estimating and measuring volume. They decompose three-dimensional shapes and find volumes of right rectangular prisms by viewing them as decomposed into layers of arrays of cubes. They measure necessary attributes of shapes in order to determine volumes to solve real world and mathematical problems.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Grade 5 Overview

Operations and Algebraic Thinking

- Write and interpret numerical expressions.
- Analyze patterns and relationships.

Number and Operations in Base Ten

- Understand the place value system.
- Perform operations with multi-digit whole numbers and with decimals to hundredths.

Number and Operations—Fractions

- Use equivalent fractions as a strategy to add and subtract fractions.
- Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

Measurement and Data

- Convert like measurement units within a given measurement system.
- Represent and interpret data.
- Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.

Geometry

- Graph points on the coordinate plane to solve real-world and mathematical problems.
- Classify two-dimensional figures into categories based on their properties.

Operations & Algebraic Thinking 5.OA

Write and interpret numerical expressions.

1. Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.

2. Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7). Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.*

Analyze patterns and relationships.

3. Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. *For example, given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.*

Number & Operations in Base Ten	**5.NBT**

Understand the place value system.

1. Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.

2. Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.

3. Read, write, and compare decimals to thousandths.

   a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., 347.392 = 3 × 100 + 4 × 10 + 7 × 1 + 3 × (1/10) + 9 × (1/100) + 2 × (1/1000).
   b. Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

4. Use place value understanding to round decimals to any place.

Perform operations with multi-digit whole numbers and with decimals to hundredths.

5. Fluently multiply multi-digit whole numbers using the standard algorithm.

6. Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

7. Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

Number & Operations—Fractions 5.NF

Use equivalent fractions as a strategy to add and subtract fractions.

1. Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)*

2. Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. *For example, recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2.*

Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

3. Interpret a fraction as division of the numerator by the denominator ($a/b = a \div b$). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. *For example, interpret 3/4 as the result of dividing 3 by 4, noting that 3/4 multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size 3/4. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?*

4. Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.

   a. Interpret the product $(a/b) \times q$ as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$. *For example, use a visual fraction model to show (2/3) × 4 = 8/3, and create a story context for this equation. Do the same with (2/3) × (4/5) = 8/15. (In general, (a/b) × (c/d) = ac/bd.)*
   b. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.

5. Interpret multiplication as scaling (resizing), by:

   a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.
   b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence $a/b = (n \times a)/(n \times b)$ to the effect of multiplying a/b by 1.

6. Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.

7. Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.[1]

a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. *For example, create a story context for (1/3) ÷ 4, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that (1/3) ÷ 4 = 1/12 because (1/12) × 4 = 1/3.*
b. Interpret division of a whole number by a unit fraction, and compute such quotients. *For example, create a story context for 4 ÷ (1/5), and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 × (1/5) = 4.*
c. Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, how much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins?*

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[1] Students able to multiply fractions in general can develop strategies to divide fractions in general, by reasoning about the relationship between multiplication and division. But division of a fraction by a fraction is not a requirement at this grade.

Measurement & Data 5.MD

Convert like measurement units within a given measurement system.

1. Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

Represent and interpret data.

2. Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots. *For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.*

Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.

3. Recognize volume as an attribute of solid figures and understand concepts of volume measurement.

a. A cube with side length 1 unit, called a “unit cube,” is said to have “one cubic unit” of volume, and can be used to measure volume.
b. A solid figure which can be packed without gaps or overlaps using *n* unit cubes is said to have a volume of *n* cubic units.

4. Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.

5. Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.

a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication.
b. Apply the formulas $V = l \times w \times h$ and $V = b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems.

c. Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems.

Geometry 5.G

Graph points on the coordinate plane to solve real-world and mathematical problems.

1. Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., *x*-axis and *x*-coordinate, *y*-axis and *y*-coordinate).

2. Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

Classify two-dimensional figures into categories based on their properties.

3. Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.

4. Classify two-dimensional figures in a hierarchy based on properties.

Mathematics - Grade 6: Introduction

In Grade 6, instructional time should focus on four critical areas: (1) connecting ratio and rate to whole number multiplication and division and using concepts of ratio and rate to solve problems; (2) completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers; (3) writing, interpreting, and using expressions and equations; and (4) developing understanding of statistical thinking.

1. Students use reasoning about multiplication and division to solve ratio and rate problems about quantities. By viewing equivalent ratios and rates as deriving from, and extending, pairs of rows (or columns) in the multiplication table, and by analyzing simple drawings that indicate the relative size of quantities, students connect their understanding of multiplication and division with ratios and rates. Thus students expand the scope of problems for which they can use multiplication and division to solve problems, and they connect ratios and fractions. Students solve a wide variety of problems involving ratios and rates.

2. Students use the meaning of fractions, the meanings of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for dividing fractions make sense. Students use these operations to solve problems. Students extend their previous understandings of number and the ordering of numbers to the full system of rational numbers, which includes negative rational numbers, and in particular negative integers. They reason about the order and absolute value of rational numbers and about the location of points in all four quadrants of the coordinate plane.

3. Students understand the use of variables in mathematical expressions. They write expressions and equations that correspond to given situations, evaluate expressions, and use expressions and formulas to solve problems. Students understand that expressions in different forms can be equivalent, and they use the properties of operations to rewrite expressions in equivalent forms. Students know that the solutions of an equation are the values of the variables that make the equation true. Students use properties of operations and the idea of maintaining the equality of both sides of an equation to solve simple one-step equations. Students construct and analyze tables, such as tables of quantities that are in equivalent ratios, and they use equations (such as $3x = y$) to describe relationships between quantities.

4. Building on and reinforcing their understanding of number, students begin to develop their ability to think statistically. Students recognize that a data distribution may not have a definite center and that different ways to measure center yield different values. The median measures center in the sense that it is roughly the middle value. The mean measures center in the sense that it is the value that each data point would take on if the total of the data values were redistributed equally, and also in the sense that it is a balance point. Students recognize that a measure of variability (interquartile range or mean absolute deviation) can also be useful for summarizing data because two very different sets of data can have the same mean and median yet be distinguished by their variability. Students learn to describe and summarize numerical data sets, identifying clusters, peaks, gaps, and symmetry, considering the context in which the data were collected.

Students in Grade 6 also build on their work with area in elementary school by reasoning about relationships among shapes to determine area, surface area, and volume. They find areas of right triangles, other triangles, and special quadrilaterals by decomposing these shapes, rearranging or removing pieces, and relating the shapes to rectangles. Using these methods, students discuss, develop, and justify formulas for areas of triangles and parallelograms. Students find areas of polygons and surface areas of prisms and pyramids by decomposing them into pieces whose area they can determine. They reason about right rectangular prisms with fractional side lengths to extend formulas for the volume of a right rectangular prism to fractional side lengths. They prepare for work on scale drawings and constructions in Grade 7 by drawing polygons in the coordinate plane.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Grade 6 Overview

Ratios and Proportional Relationships

• Understand ratio concepts and use ratio reasoning to solve problems.

The Number System

• Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

Expressions and Equations

• Apply and extend previous understandings of arithmetic to algebraic expressions.• Reason about and solve one-variable equations and inequalities.

• Represent and analyze quantitative relationships between dependent and independent variables.

• Compute fluently with multi-digit numbers and find common factors and multiples.

• Apply and extend previous understandings of numbers to the system of rational numbers.

Geometry

• Solve real-world and mathematical problems involving area, surface area, and volume.

Statistics and Probability

• Develop understanding of statistical variability.

• Summarize and describe distributions.

Ratios & Proportional Relationships 6.RP

Understand ratio concepts and use ratio reasoning to solve problems.

1. Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."*

2. Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship. *For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."*[1]

3. Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

   a. Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.
   b. Solve unit rate problems including those involving unit pricing and constant speed. *For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?*
   c. Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.
   d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

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[1] Expectations for unit rates in this grade are limited to non-complex fractions.

The Number System 6.NS

Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

1. Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.) How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?*

Compute fluently with multi-digit numbers and find common factors and multiples.

2. Fluently divide multi-digit numbers using the standard algorithm.

3. Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

4. Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. *For example, express 36 + 8 as 4 (9 + 2).*

Apply and extend previous understandings of numbers to the system of rational numbers.

5. Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.

6. Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.

   a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., –(–3) = 3, and that 0 is its own opposite.
   b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.
   c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.

7. Understand ordering and absolute value of rational numbers.

a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. *For example, interpret –3 > –7 as a statement that –3 is located to the right of –7 on a number line oriented from left to right.*

b. Write, interpret, and explain statements of order for rational numbers in real-world contexts. *For example, write –3 ^{o}C > –7 ^{o}C to express the fact that –3 ^{o}C is warmer than –7 ^{o}C.*

c. Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. *For example, for an account balance of –30 dollars, write |–30| = 30 to describe the size of the debt in dollars.*

d. Distinguish comparisons of absolute value from statements about order. *For example, recognize that an account balance less than –30 dollars represents a debt greater than 30 dollars.*

8. Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.

Expressions & Equations 6.EE

Apply and extend previous understandings of arithmetic to algebraic expressions.

1. Write and evaluate numerical expressions involving whole-number exponents.

2. Write, read, and evaluate expressions in which letters stand for numbers.

a. Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation "Subtract y from 5" as 5 – y.*

b. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. *For example, describe the expression 2 (8 + 7) as a product of two factors; view (8 + 7) as both a single entity and a sum of two terms.*

c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). *For example, use the formulas* $V = s^3$ *and* $A = 6\,s^2$ *to find the volume and surface area of a cube with sides of length* $s = 1/2$.

3. Apply the properties of operations to generate equivalent expressions. *For example, apply the distributive property to the expression 3 (2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y.*

4. Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). *For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.*

Reason about and solve one-variable equations and inequalities.

5. Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.

6. Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

7. Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers.

8. Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams.

Represent and analyze quantitative relationships between dependent and independent variables.

9. Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time.

Geometry 6.G

Solve real-world and mathematical problems involving area, surface area, and volume.

1. Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.

2. Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = l\ w\ h$ and $V = b\ h$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.

3. Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.

4. Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.

Statistics & Probability 6.SP

Develop understanding of statistical variability.

1. Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. *For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.*

2. Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.

3. Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.

Summarize and describe distributions.

4. Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

5. Summarize numerical data sets in relation to their context, such as by:

a. Reporting the number of observations.
b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.
c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.
d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

Mathematics - Grade 7: Introduction

In Grade 7, instructional time should focus on four critical areas: (1) developing understanding of and applying proportional relationships; (2) developing understanding of operations with rational numbers and working with expressions and linear equations; (3) solving problems involving scale drawings and informal geometric constructions, and working with two- and three-dimensional shapes to solve problems involving area, surface area, and volume; and (4) drawing inferences about populations based on samples.

1. Students extend their understanding of ratios and develop understanding of proportionality to solve single- and multi-step problems. Students use their understanding of ratios and proportionality to solve a wide variety of percent problems, including those involving discounts, interest, taxes, tips, and percent increase or decrease. Students solve problems about scale drawings by relating corresponding lengths between the objects or by using the fact that relationships of lengths within an object are preserved in similar objects. Students graph proportional relationships and understand the unit rate informally as a measure of the steepness of the related line, called the slope. They distinguish proportional relationships from other relationships.

2. Students develop a unified understanding of number, recognizing fractions, decimals (that have a finite or a repeating decimal representation), and percents as different representations of rational numbers. Students extend addition, subtraction, multiplication, and division to all rational numbers, maintaining the properties of operations and the relationships between addition and subtraction, and multiplication and division. By applying these properties, and by viewing negative numbers in terms of everyday contexts (e.g., amounts owed or temperatures below zero), students explain and interpret the rules for adding, subtracting, multiplying, and dividing with negative numbers. They use the arithmetic of rational numbers as they formulate expressions and equations in one variable and use these equations to solve problems.

3. Students continue their work with area from Grade 6, solving problems involving the area and circumference of a circle and surface area of three-dimensional objects. In preparation for work on congruence and similarity in Grade 8 they reason about relationships among two-dimensional figures using scale drawings and informal geometric constructions, and they gain familiarity with the relationships between angles formed by intersecting lines. Students work with three-dimensional figures, relating them to two-dimensional figures by examining cross-sections. They solve real-world and mathematical problems involving area, surface area, and volume of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes and right prisms.

4. Students build on their previous work with single data distributions to compare two data distributions and address questions about differences between populations. They begin informal work with random sampling to generate data sets and learn about the importance of representative samples for drawing inferences.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.

reasoning of others.

7. Look for and make use of structure.

8. Look for and express regularity in repeated reasoning.

Grade 7 Overview

Ratios and Proportional Relationships

• Analyze proportional relationships and use them to solve real-world and mathematical problems.

The Number System

• Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

Expressions and Equations

• Use properties of operations to generate equivalent expressions.

• Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

Geometry

• Draw, construct and describe geometrical figures and describe the relationships between them.

• Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

Statistics and Probability

• Use random sampling to draw inferences about a population.

• Draw informal comparative inferences about two populations.

• Investigate chance processes and develop, use, and evaluate probability models.

Ratios & Proportional Relationships 7.RP

Analyze proportional relationships and use them to solve real-world and mathematical problems.

1. Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. *For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction $^{1/2}/_{1/4}$ miles per hour, equivalently 2 miles per hour.*

2. Recognize and represent proportional relationships between quantities.

a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.
b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
c. Represent proportional relationships by equations. *For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as $t = pn$.*
d. Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate.

3. Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.

The Number System 7.NS

Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

1. Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.

a. Describe situations in which opposite quantities combine to make 0. *For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.*
b. Understand $p + q$ as the number located a distance $|q|$ from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.
c. Understand subtraction of rational numbers as adding the additive inverse, $p – q = p + (–q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.
d. Apply properties of operations as strategies to add and subtract rational numbers.

2. Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (–1)(–1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.

b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then $–(p/q) = (–p)/q = p/(–q)$. Interpret quotients of rational numbers by describing real-world contexts.

c. Apply properties of operations as strategies to multiply and divide rational numbers.

d. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.

3. Solve real-world and mathematical problems involving the four operations with rational numbers.[1]

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[1] Computations with rational numbers extend the rules for manipulating fractions to complex fractions.

Expressions & Equations 7.EE

Use properties of operations to generate equivalent expressions.

1. Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

2. Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. *For example, a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05."*

Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

3. Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. *For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.*

4. Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. *For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?*

b. Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. *For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions.*

Geometry 7.G

Draw construct, and describe geometrical figures and describe the relationships between them.

1. Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

2. Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

3. Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.

Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

4. Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

5. Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

6. Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Statistics & Probability 7.SP

Use random sampling to draw inferences about a population.

1. Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

2. Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. *For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.*

Draw informal comparative inferences about two populations.

3. Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. *For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.*

4. Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. *For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.*

Investigate chance processes and develop, use, and evaluate probability models.

5. Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

6. Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. *For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.*

7. Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.

a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. *For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.*

b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. *For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?*

8. Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.

a. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.

b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., “rolling double sixes”), identify the outcomes in the sample space which compose the event.

c. Design and use a simulation to generate frequencies for compound events. *For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?*

Mathematics - Grade 8: Introduction

In Grade 8, instructional time should focus on three critical areas: (1) formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations; (2) grasping the concept of a function and using functions to describe quantitative relationships; (3) analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem.

1. Students use linear equations and systems of linear equations to represent, analyze, and solve a variety of problems. Students recognize equations for proportions ($y/x = m$ or $y = mx$) as special linear equations ($y = mx + b$), understanding that the constant of proportionality (m) is the slope, and the graphs are lines through the origin. They understand that the slope (m) of a line is a constant rate of change, so that if the input or x-coordinate changes by an amount A, the output or y-coordinate changes by the amount $m \cdot A$. Students also use a linear equation to describe the association between two quantities in bivariate data (such as arm span vs. height for students in a classroom). At this grade, fitting the model, and assessing its fit to the data are done informally. Interpreting the model in the context of the data requires students to express a relationship between the two quantities in question and to interpret components of the relationship (such as slope and y-intercept) in terms of the situation.

Students strategically choose and efficiently implement procedures to solve linear equations in one variable, understanding that when they use the properties of equality and the concept of logical equivalence, they maintain the solutions of the original equation. Students solve systems of two linear equations in two variables and relate the systems to pairs of lines in the plane; these intersect, are parallel, or are the same line. Students use linear equations, systems of linear equations, linear functions, and their understanding of slope of a line to analyze situations and solve problems.

2. Students grasp the concept of a function as a rule that assigns to each input exactly one output. They understand that functions describe situations where one quantity determines another. They can translate among representations and partial representations of functions (noting that tabular and graphical representations may be partial representations), and they describe how aspects of the function are reflected in the different representations.

3. Students use ideas about distance and angles, how they behave under translations, rotations, reflections, and dilations, and ideas about congruence and similarity to describe and analyze two-dimensional figures and to solve problems. Students show that the sum of the angles in a triangle is the angle formed by a straight line, and that various configurations of lines give rise to similar triangles because of the angles created when a transversal cuts parallel lines. Students understand the statement of the Pythagorean Theorem and its converse, and can explain why the Pythagorean Theorem holds, for example, by decomposing a square in two different ways. They apply the Pythagorean Theorem to find distances between points on the coordinate plane, to find lengths, and to analyze polygons. Students complete their work on volume by solving problems involving cones, cylinders, and spheres.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
4. Model with mathematics.
5. Use appropriate tools strategically.

2. Reason abstractly and quantitatively.

3. Construct viable arguments and critique the reasoning of others.

6. Attend to precision.

7. Look for and make use of structure.

8. Look for and express regularity in repeated reasoning.

Grade 8 Overview

The Number System

• Know that there are numbers that are not rational, and approximate them by rational numbers.

Expressions and Equations

• Work with radicals and integer exponents.

• Understand the connections between proportional relationships, lines, and linear equations.

• Analyze and solve linear equations and pairs of simultaneous linear equations.

Functions

• Define, evaluate, and compare functions.

• Use functions to model relationships between quantities.

Geometry

• Understand congruence and similarity using physical models, transparencies, or geometry software.

• Understand and apply the Pythagorean Theorem.

• Solve real-world and mathematical problems involving volume of cylinders, cones and spheres.

Statistics and Probability

• Investigate patterns of association in bivariate data.

The Number System 8.NS

Know that there are numbers that are not rational, and approximate them by rational numbers.

1. Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.

2. Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2). *For example, by truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.*

Expressions & Equations 8.EE

Work with radicals and integer exponents.

1. Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.

2. Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.

3. Use numbers expressed in the form of a single digit times a whole-number power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. *For example, estimate the population of the United States as 3 times 10^8 and the population of the world as 7 times 10^9, and determine that the world population is more than 20 times larger.*

4. Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.

Understand the connections between proportional relationships, lines, and linear equations.

5. Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.

6. Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation y = mx for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.

Analyze and solve linear equations and pairs of simultaneous linear equations.

7. Solve linear equations in one variable.

a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers).

b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

8. Analyze and solve pairs of simultaneous linear equations.

a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.

b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. *For example, $3x + 2y = 5$ and $3x + 2y = 6$ have no solution because $3x + 2y$ cannot simultaneously be 5 and 6.*

c. Solve real-world and mathematical problems leading to two linear equations in two variables. *For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.*

Functions 8.F

Define, evaluate, and compare functions.

1. Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.[1]

2. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.*

3. Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. *For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.*

Use functions to model relationships between quantities.

4. Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

5. Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

[1]Function notation is not required in Grade 8.

Geometry 8.G

Understand congruence and similarity using physical models, transparencies, or geometry software.

1. Verify experimentally the properties of rotations, reflections, and translations:

   a. Lines are taken to lines, and line segments to line segments of the same length.
   b. Angles are taken to angles of the same measure.
   c. Parallel lines are taken to parallel lines.

2. Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.

3. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

4. Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

5. Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.*

Understand and apply the Pythagorean Theorem.

6. Explain a proof of the Pythagorean Theorem and its converse.

7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.

9. Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

Statistics & Probability 8.SP

Investigate patterns of association in bivariate data.

1. Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.

2. Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.

3. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. *For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.*

4. Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. *For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?*

Mathematics Standards for High School

The high school standards specify the mathematics that all students should study in order to be college and career ready. Additional mathematics that students should learn in order to take advanced courses such as calculus, advanced statistics, or discrete mathematics is indicated by (+), as in this example:

(+) Represent complex numbers on the complex plane in rectangular and polar form (including real and imaginary numbers).

All standards without a (+) symbol should be in the common mathematics curriculum for all college and career ready students. Standards with a (+) symbol may also appear in courses intended for all students.

The high school standards are listed in conceptual categories:

- Number and Quantity
- Algebra
- Functions
- Modeling
- Geometry
- Statistics and Probability

Conceptual categories portray a coherent view of high school mathematics; a student's work with functions, for example, crosses a number of traditional course boundaries, potentially up through and including calculus.

Modeling is best interpreted not as a collection of isolated topics but in relation to other standards. Making mathematical models is a Standard for Mathematical Practice, and specific modeling standards appear throughout the high school standards indicated by a star symbol (*). The star symbol sometimes appears on the heading for a group of standards; in that case, it should be understood to apply to all standards in that group.

Mathematics - High School Number & Quantity: Introduction

Numbers and Number Systems.

During the years from kindergarten to eighth grade, students must repeatedly extend their conception of number. At first, "number" means "counting number": 1, 2, 3, … Soon after that, 0 is used to represent "none" and the whole numbers are formed by the counting numbers together with zero. The next extension is fractions. At first, fractions are barely numbers and tied strongly to pictorial representations. Yet by the time students understand division of fractions, they have a strong concept of fractions as numbers and have connected them, via their decimal representations, with the base-ten system used to represent the whole numbers. During middle school, fractions are augmented by negative fractions to form the rational numbers. In Grade 8, students extend this system once more, augmenting the rational numbers with the irrational numbers to form the real numbers. In high school, students will be exposed to yet another extension of number, when the real numbers are augmented by the imaginary numbers to form the complex numbers.

With each extension of number, the meanings of addition, subtraction, multiplication, and division are extended. In each new number system—integers, rational numbers, real numbers, and complex numbers—the four operations stay the same in two important ways: They have the commutative, associative, and distributive properties and their new meanings are consistent with their previous meanings.

Extending the properties of whole-number exponents leads to new and productive notation. For example, properties of whole-number exponents suggest that (51/3)3 should be 5(1/3)3 = 51 = 5 and that 51/3 should be the cube root of 5.

Calculators, spreadsheets, and computer algebra systems can provide ways for students to become better acquainted with these new number systems and their notation. They can be used to generate data for numerical experiments, to help understand the workings of matrix, vector, and complex number algebra, and to experiment with non-integer exponents.

Quantities.

In real world problems, the answers are usually not numbers but quantities: numbers with units, which involves measurement. In their work in measurement up through Grade 8, students primarily measure commonly used attributes such as length, area, and volume. In high school, students encounter a wider variety of units in modeling, e.g. acceleration, currency conversions, derived quantities such as person-hours and heating degree days, social science rates such as per-capita income, and rates in everyday life such as points scored per game or batting averages. They also encounter novel situations in which they themselves must conceive the attributes of interest. For example, to find a good measure of overall highway safety, they might propose measures such as fatalities per year, fatalities per year per driver, or fatalities per vehicle-mile traveled. Such a conceptual process might be called quantification. Quantification is important for science, as when surface area suddenly “stands out” as an important variable in evaporation. Quantification is also important for companies, which must conceptualize relevant attributes and create or choose suitable measures for them.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Number and Quantity Overview

The Real Number System
• Extend the properties of exponents to rational exponents
• Use properties of rational and irrational numbers.

Quantities
• Reason quantitatively and use units to solve problems

The Complex Number System
• Perform arithmetic operations with complex numbers
• Represent complex numbers and their operations on the complex plane
• Use complex numbers in polynomial identities and equations

Vector and Matrix Quantities
• Represent and model with vector quantities.
• Perform operations on vectors.
• Perform operations on matrices and use matrices in applications.

The Real Number System N-RN

Extend the properties of exponents to rational exponents.

1. Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. *For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5.*

2. Rewrite expressions involving radicals and rational exponents using the properties of exponents.

Use properties of rational and irrational numbers.

3. Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.

Quantities N-Q

Reason quantitatively and use units to solve problems.

1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

2. Define appropriate quantities for the purpose of descriptive modeling.

3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

The Complex Number System N-CN

Perform arithmetic operations with complex numbers.

1. Know there is a complex number i such that $i^2 = -1$, and every complex number has the form $a + bi$ with a and b real.

2. Use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.

3. (+) Find the conjugate of a complex number; use conjugates to find moduli and quotients of complex numbers.

Represent complex numbers and their operations on the complex plane.

4. (+) Represent complex numbers on the complex plane in rectangular and polar form (including real and imaginary numbers), and explain why the rectangular and polar forms of a given complex number represent the same number.

5. (+) Represent addition, subtraction, multiplication, and conjugation of complex numbers geometrically on the complex plane; use properties of this representation for computation. *For example,* $(-1 + \sqrt{3}\, i)^3 = 8$ *because* $(-1 + \sqrt{3}\, i)$ *has modulus 2 and argument 120°.*

6. (+) Calculate the distance between numbers in the complex plane as the modulus of the difference, and the midpoint of a segment as the average of the numbers at its endpoints.

Use complex numbers in polynomial identities and equations.

7. Solve quadratic equations with real coefficients that have complex solutions.

8. (+) Extend polynomial identities to the complex numbers. *For example, rewrite* $x^2 + 4$ *as* $(x + 2i)(x - 2i)$.

9. (+) Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.

Vector & Matrix Quantities N-VM

Represent and model with vector quantities.

1. (+) Recognize vector quantities as having both magnitude and direction. Represent vector quantities by directed line segments, and use appropriate symbols for vectors and their magnitudes (e.g., $\boldsymbol{v}$, $|\boldsymbol{v}|$, $||\boldsymbol{v}||$, v).

2. (+) Find the components of a vector by subtracting the coordinates of an initial point from the coordinates of a terminal point.

3. (+) Solve problems involving velocity and other quantities that can be represented by vectors.

Perform operations on vectors.

4. (+) Add and subtract vectors.

   a. Add vectors end-to-end, component-wise, and by the parallelogram rule. Understand that the magnitude of a sum of two vectors is typically not the sum of the magnitudes.
   b. Given two vectors in magnitude and direction form, determine the magnitude and direction of their sum.
   c. Understand vector subtraction $\boldsymbol{v} - \boldsymbol{w}$ as $\boldsymbol{v} + (-\boldsymbol{w})$, where $-\boldsymbol{w}$ is the additive inverse of $\boldsymbol{w}$, with the same magnitude as $\boldsymbol{w}$ and pointing in the opposite direction. Represent vector subtraction graphically by connecting the tips in the appropriate order, and perform vector subtraction component-wise.

5. (+) Multiply a vector by a scalar.

   a. Represent scalar multiplication graphically by scaling vectors and possibly reversing their direction; perform scalar multiplication component-wise, e.g., as $c(v_x, v_y) = (cv_x, cv_y)$.
   b. Compute the magnitude of a scalar multiple $c\boldsymbol{v}$ using $||c\boldsymbol{v}|| = |c|\boldsymbol{v}$. Compute the direction of $c\boldsymbol{v}$ knowing that when $|c|\boldsymbol{v} \neq 0$, the direction of $c\boldsymbol{v}$ is either along $\boldsymbol{v}$ (for $c > 0$) or against $\boldsymbol{v}$ (for $c < 0$).

Perform operations on matrices and use matrices in applications.

6. (+) Use matrices to represent and manipulate data, e.g., to represent payoffs or incidence relationships in a network.

7. (+) Multiply matrices by scalars to produce new matrices, e.g., as when all of the payoffs in a game are doubled.

8. (+) Add, subtract, and multiply matrices of appropriate dimensions.

9. (+) Understand that, unlike multiplication of numbers, matrix multiplication for square matrices is not a commutative operation, but still satisfies the associative and distributive properties.

10. (+) Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. The determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse.

11. (+) Multiply a vector (regarded as a matrix with one column) by a matrix of suitable dimensions to produce another vector. Work with matrices as transformations of vectors.

12. (+) Work with 2 × 2 matrices as a transformations of the plane, and interpret the absolute value of the determinant in terms of area.

Mathematics - High School Algebra: Introduction

Expressions.

An expression is a record of a computation with numbers, symbols that represent numbers, arithmetic operations, exponentiation, and, at more advanced levels, the operation of evaluating a function. Conventions about the use of parentheses and the order of operations assure that each expression is unambiguous. Creating an expression that describes a computation involving a general quantity requires the ability to express the computation in general terms, abstracting from specific instances.

Reading an expression with comprehension involves analysis of its underlying structure. This may suggest a different but equivalent way of writing the expression that exhibits some different aspect of its meaning. For example, $p + 0.05p$ can be interpreted as the addition of a 5% tax to a price p. Rewriting $p + 0.05p$ as $1.05p$ shows that adding a tax is the same as multiplying the price by a constant factor.

Algebraic manipulations are governed by the properties of operations and exponents, and the conventions of algebraic notation. At times, an expression is the result of applying operations to simpler expressions. For example, $p + 0.05p$ is the sum of the simpler expressions p and $0.05p$. Viewing an expression as the result of operation on simpler expressions can sometimes clarify its underlying structure.

A spreadsheet or a computer algebra system (CAS) can be used to experiment with algebraic expressions, perform complicated algebraic manipulations, and understand how algebraic manipulations behave.

Equations and inequalities.

An equation is a statement of equality between two expressions, often viewed as a question asking for which values of the variables the expressions on either side are in fact equal. These values are the solutions to the equation. An identity, in contrast, is true for all values of the variables; identities are often developed by rewriting an expression in an equivalent form.

The solutions of an equation in one variable form a set of numbers; the solutions of an equation in two variables form a set of ordered pairs of numbers, which can be plotted in the coordinate plane. Two or more equations and/or inequalities form a system. A solution for such a system must satisfy every equation and inequality in the system.

An equation can often be solved by successively deducing from it one or more simpler equations. For example, one can add the same constant to both sides without changing the solutions, but squaring both sides might lead to extraneous solutions. Strategic competence in solving includes looking ahead for productive manipulations and anticipating the nature and number of solutions.

Some equations have no solutions in a given number system, but have a solution in a larger system. For example, the solution of $x + 1 = 0$ is an integer, not a whole number; the solution of $2x + 1 = 0$ is a rational number, not an integer; the solutions of $x^2 – 2 = 0$ are real numbers, not rational numbers; and the solutions of $x^2 + 2 = 0$ are complex numbers, not real numbers.

The same solution techniques used to solve equations can be used to rearrange formulas. For example, the formula for the area of a trapezoid, $A = ((b_1+b_2)/2)h$, can be solved for h using the same deductive process.

Inequalities can be solved by reasoning about the properties of inequality. Many, but not all, of the properties of equality continue to hold for inequalities and can be useful in solving them.

Connections to Functions and Modeling.

Expressions can define functions, and equivalent expressions define the same function. Asking when two functions have the same value for the same input leads to an equation; graphing the two functions allows for finding approximate solutions of the equation. Converting a verbal description to an equation, inequality, or system of these is an essential skill in modeling.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Algebra Overview

Seeing Structure in Expressions

• Interpret the structure of expressions

• Write expressions in equivalent forms to solve problems

Arithmetic with Polynomials and Rational Expressions

• Perform arithmetic operations on polynomials

• Understand the relationship between zeros and factors of polynomials

• Use polynomial identities to solve problems

Creating Equations

• Create equations that describe numbers or relationships

Reasoning with Equations and Inequalities

• Understand solving equations as a process of reasoning and explain the reasoning

• Solve equations and inequalities in one variable

• Solve systems of equations

• Represent and solve equations and inequalities graphically

• Rewrite rational expressions

Seeing Structure in Expressions A-SSE

Interpret the structure of expressions.

1. Interpret expressions that represent a quantity in terms of its context.

a. Interpret parts of an expression, such as terms, factors, and coefficients.
b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret $P(1+r)^n$ as the product of P and a factor not depending on P.*

2. Use the structure of an expression to identify ways to rewrite it. *For example, see $x^4 – y^4$ as $(x^2)^2 – (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 – y^2)(x^2 + y^2)$.*

Write expressions in equivalent forms to solve problems.

3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

a. Factor a quadratic expression to reveal the zeros of the function it defines.
b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.
c. Use the properties of exponents to transform expressions for exponential functions. *For example the expression 1.15^t can be rewritten as $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.*

4. Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. *For example, calculate mortgage payments.*

Arithmetic with Polynomials & Rational Expressions A-APR

Perform arithmetic operations on polynomials.

1. Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

Understand the relationship between zeros and factors of polynomials.

2. Know and apply the Remainder Theorem: For a polynomial $p(x)$ and a number a, the remainder on division by $x – a$ is $p(a)$, so $p(a) = 0$ if and only if $(x – a)$ is a factor of $p(x)$.

3. Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.

Use polynomial identities to solve problems.

4. Prove polynomial identities and use them to describe numerical relationships. *For example, the polynomial identity* $(x^2 + y^2)^2 = (x^2 - y^2)^2 + (2xy)^2$ *can be used to generate Pythagorean triples.*

5. (+) Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle.[1]

Rewrite rational expressions.

6. Rewrite simple rational expressions in different forms; write $a(x)/b(x)$ in the form $q(x) + r(x)/b(x)$, where $a(x)$, $b(x)$, $q(x)$, and $r(x)$ are polynomials with the degree of $r(x)$ less than the degree of $b(x)$, using inspection, long division, or, for the more complicated examples, a computer algebra system.

7. (+) Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.

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[1] The Binomial Theorem can be proved by mathematical induction or by a combinatorial argument.

Creating Equations A-CED

Create equations that describe numbers or relationships.

1. Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*

2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.*

4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law V = IR to highlight resistance R.*

Reasoning with Equations & Inequalities A-REI

Understand solving equations as a process of reasoning and explain the reasoning.

1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

2. Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

Solve equations and inequalities in one variable.

3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

4. Solve quadratic equations in one variable.

a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x – p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.
b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.

Solve systems of equations.

5. Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.

6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

7. Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line $y = –3x$ and the circle $x^2 + y^2 = 3$.

8. (+) Represent a system of linear equations as a single matrix equation in a vector variable.

9. (+) Find the inverse of a matrix if it exists and use it to solve systems of linear equations (using technology for matrices of dimension 3 × 3 or greater).

Represent and solve equations and inequalities graphically.

10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).

11. Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.

12. Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

Mathematics - High School Functions: Introduction

Functions describe situations where one quantity determines another. For example, the return on $10,000 invested at an annualized percentage rate of 4.25% is a function of the length of time the money is invested. Because we continually make theories about dependencies between quantities in nature and society, functions are important tools in the construction of mathematical models.

In school mathematics, functions usually have numerical inputs and outputs and are often defined by an algebraic expression. For example, the time in hours it takes for a car to drive 100 miles is a function of the car's speed in miles per hour, v; the rule $T(v) = 100/v$ expresses this relationship algebraically and defines a function whose name is T.

The set of inputs to a function is called its domain. We often infer the domain to be all inputs for which the expression defining a function has a value, or for which the function makes sense in a given context.

A function can be described in various ways, such as by a graph (e.g., the trace of a seismograph); by a verbal rule, as in, "I'll give you a state, you give me the capital city;" by an algebraic expression like $f(x) = a + bx$; or by a recursive rule. The graph of a function is often a useful way of visualizing the relationship of the function models, and manipulating a mathematical expression for a function can throw light on the function's properties.

Functions presented as expressions can model many important phenomena. Two important families of functions characterized by laws of growth are linear functions, which grow at a constant rate, and exponential functions, which grow at a constant percent rate. Linear functions with a constant term of zero describe proportional relationships.

A graphing utility or a computer algebra system can be used to experiment with properties of these functions and their graphs and to build computational models of functions, including recursively defined functions.

Connections to Expressions, Equations, Modeling, and Coordinates.

Determining an output value for a particular input involves evaluating an expression; finding inputs that yield a given output involves solving an equation. Questions about when two functions have the same value for the same input lead to equations, whose solutions can be visualized from the intersection of their graphs. Because functions describe relationships between quantities, they are frequently used in modeling. Sometimes functions are defined by a recursive process, which can be displayed effectively using a spreadsheet or other technology.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Functions Overview

Interpreting Functions

• Understand the concept of a function and use function notation

• Interpret functions that arise in applications in terms of the context

• Analyze functions using different representations

Building Functions

• Build a function that models a relationship between two quantities

• Build new functions from existing functions

Linear, Quadratic, and Exponential Models

• Construct and compare linear, quadratic, and exponential models and solve problems

• Interpret expressions for functions in terms of the situation they model

Trigonometric Functions

• Extend the domain of trigonometric functions using the unit circle

• Model periodic phenomena with trigonometric functions

• Prove and apply trigonometric identities

Interpreting Functions F-IF

Understand the concept of a function and use function notation.

1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If *f* is a function and *x* is an element of its domain, then *f*(*x*) denotes the output of *f* corresponding to the input *x*. The graph of *f* is the graph of the equation *y* = *f*(*x*).

2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≥ 1.*

Interpret functions that arise in applications in terms of the context.

4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. *Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity*.

5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.*

6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.

Analyze functions using different representations.

7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

   a. Graph linear and quadratic functions and show intercepts, maxima, and minima.
   b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
   c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
   d. (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior.
   e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.

8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

   a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.
   b. Use the properties of exponents to interpret expressions for exponential functions. For example, identify percent rate of change in functions such as y = (1.02)t, y = (0.97)t, y = (1.01)12t, y = (1.2)t/10, and classify them as representing exponential growth or decay.

9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*

Building Functions F-BF

Build a function that models a relationship between two quantities.

1. Write a function that describes a relationship between two quantities.

   a. Determine an explicit expression, a recursive process, or steps for calculation from a context.
   b. Combine standard function types using arithmetic operations. *For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.*
   c. (+) Compose functions. *For example, if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time.*

2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.

Build new functions from existing functions.

3. Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k\, f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

4. Find inverse functions.

   a. Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. *For example,* $f(x) =2\, x^3$ *or* $f(x) = (x+1)/(x–1)$ *for* $x \neq 1$.
   b. (+) Verify by composition that one function is the inverse of another.
   c. (+) Read values of an inverse function from a graph or a table, given that the function has an inverse.
   d. (+) Produce an invertible function from a non-invertible function by restricting the domain.

5. (+) Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.

Linear, Quadratic, & Exponential Models F-LE

Construct and compare linear, quadratic, and exponential models and solve problems.

1. Distinguish between situations that can be modeled with linear functions and with exponential functions.

   a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
   b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
   c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

2. Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).

3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.

4. For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where *a*, *c*, and *d* are numbers and the base *b* is 2, 10, or *e*; evaluate the logarithm using technology.

Interpret expressions for functions in terms of the situation they model.

5. Interpret the parameters in a linear or exponential function in terms of a context.

Trigonometric Functions F-TF

Extend the domain of trigonometric functions using the unit circle.

1. Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.

2. Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.

3. (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for π/3, π/4 and π/6, and use the unit circle to express the values of sine, cosines, and tangent for *x*, π + *x*, and 2π – *x* in terms of their values for *x*, where *x* is any real number.

4. (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.

Model periodic phenomena with trigonometric functions.

5. Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.

6. (+) Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.

7. (+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.

Prove and apply trigonometric identities.

8. Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it to find sin(θ), cos(θ), or tan(θ) given sin(θ), cos(θ), or tan(θ) and the quadrant of the angle.

9. (+) Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.

Modeling links classroom mathematics and statistics to everyday life, work, and decision-making. Modeling is the process of choosing and using appropriate mathematics and statistics to analyze empirical situations, to understand them better, and to improve decisions. Quantities and their relationships in physical, economic, public policy, social, and everyday situations can be modeled using mathematical and statistical methods. When making mathematical models, technology is valuable for varying assumptions, exploring consequences, and comparing predictions with data.

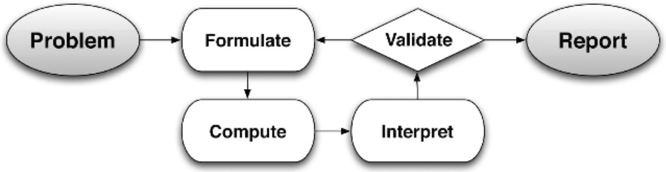
A model can be very simple, such as writing total cost as a product of unit price and number bought, or using a geometric shape to describe a physical object like a coin. Even such simple models involve making choices. It is up to us whether to model a coin as a three-dimensional cylinder, or whether a two-dimensional disk works well enough for our purposes. Other situations—modeling a delivery route, a production schedule, or a comparison of loan amortizations—need more elaborate models that use other tools from the mathematical sciences. Real-world situations are not organized and labeled for analysis; formulating tractable models, representing such models, and analyzing them is appropriately a creative process. Like every such process, this depends on acquired expertise as well as creativity.

Some examples of such situations might include:

- Estimating how much water and food is needed for emergency relief in a devastated city of 3 million people, and how it might be distributed.
- Planning a table tennis tournament for 7 players at a club with 4 tables, where each player plays against each other player.
- Designing the layout of the stalls in a school fair so as to raise as much money as possible.
- Analyzing stopping distance for a car.
- Modeling savings account balance, bacterial colony growth, or investment growth.
- Engaging in critical path analysis, e.g., applied to turnaround of an aircraft at an airport.
- Analyzing risk in situations such as extreme sports, pandemics, and terrorism.
- Relating population statistics to individual predictions.

In situations like these, the models devised depend on a number of factors: How precise an answer do we want or need? What aspects of the situation do we most need to understand, control, or optimize? What resources of time and tools do we have? The range of models that we can create and analyze is also constrained by the limitations of our mathematical, statistical, and technical skills, and our ability to recognize significant variables and relationships among them. Diagrams of various kinds, spreadsheets and other technology, and algebra are powerful tools for understanding and solving problems drawn from different types of real-world situations.

One of the insights provided by mathematical modeling is that essentially the same mathematical or statistical structure can sometimes model seemingly different situations. Models can also shed light on the mathematical structures themselves, for example, as when a model of bacterial growth makes more vivid the explosive growth of the exponential function.



The basic modeling cycle is summarized in the diagram. It involves (1) identifying variables in the situation and selecting those that represent essential features, (2) formulating a model by creating and selecting geometric, graphical, tabular, algebraic, or statistical representations that describe relationships between the variables, (3) analyzing and performing operations on these relationships to draw conclusions, (4) interpreting the results of the mathematics in terms of the original situation, (5) validating the conclusions by comparing them with the situation, and then either improving the model or, if it is acceptable, (6) reporting on the conclusions and the reasoning behind them. Choices, assumptions, and approximations are present throughout this cycle.

In descriptive modeling, a model simply describes the phenomena or summarizes them in a compact form. Graphs of observations are a familiar descriptive model—for example, graphs of global temperature and atmospheric CO2 over time.

Analytic modeling seeks to explain data on the basis of deeper theoretical ideas, albeit with parameters that are empirically based; for example, exponential growth of bacterial colonies (until cut-off mechanisms such as pollution or starvation intervene) follows from a constant reproduction rate. Functions are an important tool for analyzing such problems.

Graphing utilities, spreadsheets, computer algebra systems, and dynamic geometry software are powerful tools that can be used to model purely mathematical phenomena (e.g., the behavior of polynomials) as well as physical phenomena.

Modeling Standards

Modeling is best interpreted not as a collection of isolated topics but rather in relation to other standards. Making mathematical models is a Standard for Mathematical Practice, and specific modeling standards appear throughout the high school standards indicated by a star symbol (□).

Mathematics - High School Geometry: Introduction

An understanding of the attributes and relationships of geometric objects can be applied in diverse contexts—interpreting a schematic drawing, estimating the amount of wood needed to frame a sloping roof, rendering computer graphics, or designing a sewing pattern for the most efficient use of material.

Although there are many types of geometry, school mathematics is devoted primarily to plane Euclidean geometry, studied both synthetically (without coordinates) and analytically (with coordinates). Euclidean geometry is characterized most importantly by the Parallel Postulate, that through a point not on a given line there is exactly one parallel line. (Spherical geometry, in contrast, has no parallel lines.)

During high school, students begin to formalize their geometry experiences from elementary and middle school, using more precise definitions and developing careful proofs. Later in college some students develop Euclidean and other geometries carefully from a small set of axioms.

The concepts of congruence, similarity, and symmetry can be understood from the perspective of geometric transformation. Fundamental are the rigid motions: translations, rotations, reflections, and combinations of these, all of which are here assumed to preserve distance and angles (and therefore shapes generally). Reflections and rotations each explain a particular type of symmetry, and the symmetries of an object offer insight into its attributes—as when the reflective symmetry of an isosceles triangle assures that its base angles are congruent.

In the approach taken here, two geometric figures are defined to be congruent if there is a sequence of rigid motions that carries one onto the other. This is the principle of superposition. For triangles, congruence means the equality of all corresponding pairs of sides and all corresponding pairs of angles. During the middle grades, through experiences drawing triangles from given conditions, students notice ways to specify enough measures in a triangle to ensure that all triangles drawn with those measures are congruent. Once these triangle congruence criteria (ASA, SAS, and SSS) are established using rigid motions, they can be used to prove theorems about triangles, quadrilaterals, and other geometric figures.

Similarity transformations (rigid motions followed by dilations) define similarity in the same way that rigid motions define congruence, thereby formalizing the similarity ideas of "same shape" and "scale factor" developed in the middle grades. These transformations lead to the criterion for triangle similarity that two pairs of corresponding angles are congruent.

The definitions of sine, cosine, and tangent for acute angles are founded on right triangles and similarity, and, with the Pythagorean Theorem, are fundamental in many real-world and theoretical situations. The Pythagorean Theorem is generalized to non-right triangles by the Law of Cosines. Together, the Laws of Sines and Cosines embody the triangle congruence criteria for the cases where three pieces of information suffice to completely solve a triangle. Furthermore, these laws yield two possible solutions in the ambiguous case, illustrating that Side-Side-Angle is not a congruence criterion.

Analytic geometry connects algebra and geometry, resulting in powerful methods of analysis and problem solving. Just as the number line associates numbers with locations in one dimension, a pair of perpendicular axes associates pairs of numbers with locations in two dimensions. This correspondence between numerical coordinates and geometric points allows methods from algebra to be applied to geometry and vice versa. The solution set of an equation becomes a geometric curve, making visualization a tool for doing and understanding algebra. Geometric shapes can be described by equations, making algebraic manipulation into a tool for geometric understanding, odeling, and proof. Geometric transformations of the graphs of equations correspond to algebraic changes in their equations.

Dynamic geometry environments provide students with experimental and modeling tools that allow them to investigate geometric phenomena in much the same way as computer algebra systems allow them to experiment with algebraic phenomena.

Connections to Equations.

The correspondence between numerical coordinates and geometric points allows methods from algebra to be applied to geometry and vice versa. The solution set of an equation becomes a geometric curve, making visualization a tool for doing and understanding algebra. Geometric shapes can be described by equations, making algebraic manipulation into a tool for geometric understanding, modeling, and proof.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Geometry Overview

Congruence

- Experiment with transformations in the plane
- Understand congruence in terms of rigid motions
- Prove geometric theorems
- Make geometric constructions

Similarity, Right Triangles, and Trigonometry

- Understand similarity in terms of similarity transformations
- Prove theorems involving similarity
- Define trigonometric ratios and solve problems involving right triangles
- Apply trigonometry to general triangles

Circles

- Understand and apply theorems about circles
- Find arc lengths and areas of sectors of circles

Expressing Geometric Properties with Equations

- Translate between the geometric description and the equation for a conic section
- Use coordinates to prove simple geometric theorems algebraically

Geometric Measurement and Dimension

- Explain volume formulas and use them to solve problems
- Visualize relationships between twodimensional and three-dimensional objects

Modeling with Geometry

- Apply geometric concepts in modeling situations

Congruence G-CO

Experiment with transformations in the plane

1. Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.

2. Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).

3. Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.

4. Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.

5. Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.

Understand congruence in terms of rigid motions

6. Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.

7. Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.

8. Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.

Prove geometric theorems

9. Prove theorems about lines and angles. *Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.*

10. Prove theorems about triangles. *Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.*

11. Prove theorems about parallelograms. *Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.*

Make geometric constructions

12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). *Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.*

13. Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

Similarity, Right Triangles, & Trigonometry **G-SRT**

Understand similarity in terms of similarity transformations

1. Verify experimentally the properties of dilations given by a center and a scale factor:

   a. A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.
   b. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.

2. Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.

3. Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.

Prove theorems involving similarity

4. Prove theorems about triangles. *Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.*

5. Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

Define trigonometric ratios and solve problems involving right triangles

6. Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.

7. Explain and use the relationship between the sine and cosine of complementary angles.

8. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

Apply trigonometry to general triangles

9. (+) Derive the formula $A = 1/2\ ab \sin(C)$ for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side.

10. (+) Prove the Laws of Sines and Cosines and use them to solve problems.

11. (+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces).

Circles G-C

Understand and apply theorems about circles

1. Prove that all circles are similar.

2. Identify and describe relationships among inscribed angles, radii, and chords. *Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.*

3. Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.

4. (+) Construct a tangent line from a point outside a given circle to the circle.

Find arc lengths and areas of sectors of circles

5. Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.

Expressing Geometric Properties with Equations G-GPE

Translate between the geometric description and the equation for a conic section

1. Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.

2. Derive the equation of a parabola given a focus and directrix.

3. (+) Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant.

Use coordinates to prove simple geometric theorems algebraically

4. Use coordinates to prove simple geometric theorems algebraically. *For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2).*

5. Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

6. Find the point on a directed line segment between two given points that partitions the segment in a given ratio.

7. Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.

Geometric Measurement & Dimension G-GMD

Explain volume formulas and use them to solve problems

1. Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. *Use dissection arguments, Cavalieri's principle, and informal limit arguments.*

2. (+) Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures.

3. Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.

Visualize relationships between two-dimensional and three-dimensional objects

4. Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects.

Modeling with Geometry G-MG

Apply geometric concepts in modeling situations

1. Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).

2. Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).

3. Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).

Mathematics - High School Statistics & Probability: Introduction

Decisions or predictions are often based on data—numbers in context. These decisions or predictions would be easy if the data always sent a clear message, but the message is often obscured by variability. Statistics provides tools for describing variability in data and for making informed decisions that take it into account.

Data are gathered, displayed, summarized, examined, and interpreted to discover patterns and deviations from patterns. Quantitative data can be described in terms of key characteristics: measures of shape, center, and spread. The shape of a data distribution might be described as symmetric, skewed, flat, or bell shaped, and it might be summarized by a statistic measuring center (such as mean or median) and a statistic measuring spread (such as standard deviation or interquartile range). Different distributions can be compared numerically using these statistics or compared visually using plots. Knowledge of center and spread are not enough to describe a distribution. Which statistics to compare, which plots to use, and what the results of a comparison might mean, depend on the question to be investigated and the real-life actions to be taken.

Randomization has two important uses in drawing statistical conclusions. First, collecting data from a random sample of a population makes it possible to draw valid conclusions about the whole population, taking variability into account. Second, randomly assigning individuals to different treatments allows a fair comparison of the effectiveness of those treatments. A statistically significant outcome is one that is unlikely to be due to chance alone, and this can be evaluated only under the condition of randomness. The conditions under which data are collected are important in drawing conclusions from the data; in critically reviewing uses of statistics in public media and other reports, it is important to consider the study design, how the data were gathered, and the analyses employed as well as the data summaries and the conclusions drawn.

Random processes can be described mathematically by using a probability model: a list or description of the possible outcomes (the sample space), each of which is assigned a probability. In situations such as flipping a coin, rolling a number cube, or drawing a card, it might be reasonable to assume various outcomes are equally likely. In a probability model, sample points represent outcomes and combine to make up events; probabilities of events can be computed by applying the Addition and Multiplication Rules. Interpreting these probabilities relies on an understanding of independence and conditional probability, which can be approached through the analysis of two-way tables.

Technology plays an important role in statistics and probability by making it possible to generate plots, regression functions, and correlation coefficients, and to simulate many possible outcomes in a short amount of time.

Connections to Functions and Modeling.

Functions may be used to describe data; if the data suggest a linear relationship, the relationship can be modeled with a regression line, and its strength and direction can be expressed through a correlation coefficient.

Mathematical Practices

1. Make sense of problems and persevere in solving them.

4. Model with mathematics.

5. Use appropriate tools strategically.

2. Reason abstractly and quantitatively.

3. Construct viable arguments and critique the reasoning of others.

6. Attend to precision.

7. Look for and make use of structure.

8. Look for and express regularity in repeated reasoning.

Statistics and Probability Overview

Interpreting Categorical and Quantitative Data

• Summarize, represent, and interpret data on a single count or measurement variable

• Summarize, represent, and interpret data on two categorical and quantitative variables

• Interpret linear models

Making Inferences and Justifying Conclusions

• Understand and evaluate random processes underlying statistical experiments

• Make inferences and justify conclusions from sample surveys, experiments and observational studies

Conditional Probability and the Rules of Probability

• Understand independence and conditional probability and use them to interpret data

• Use the rules of probability to compute probabilities of compound events in a uniform probability model

Using Probability to Make Decisions

• Calculate expected values and use them to solve problems

• Use probability to evaluate outcomes of decisions

Interpreting Categorical & Quantitative Data S-ID

Summarize, represent, and interpret data on a single count or measurement variable

1. Represent data with plots on the real number line (dot plots, histograms, and box plots).

2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

Summarize, represent, and interpret data on two categorical and quantitative variables

5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.

6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.
b. Informally assess the fit of a function by plotting and analyzing residuals.
c. Fit a linear function for a scatter plot that suggests a linear association.

Interpret linear models

7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

8. Compute (using technology) and interpret the correlation coefficient of a linear fit.

9. Distinguish between correlation and causation.

Making Inferences & Justifying Conclusions S-IC

Understand and evaluate random processes underlying statistical experiments

1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.

2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. *For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?*

Make inferences and justify conclusions from sample surveys, experiments, and observational studies

3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.

4. Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.

5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.

6. Evaluate reports based on data.

Conditional Probability & the Rules of Probability S-CP

Understand independence and conditional probability and use them to interpret data

1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”).

2. Understand that two events *A* and *B* are independent if the probability of *A* and *B* occurring together is the product of their probabilities, and use this characterization to determine if they are independent.

3. Understand the conditional probability of *A* given *B* as *P*(*A* and *B*)/*P*(*B*), and interpret independence of *A* and *B* as saying that the conditional probability of *A* given *B* is the same as the probability of *A*, and the conditional probability of *B* given *A* is the same as the probability of *B*.

4. Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. *For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.*

5. Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.*

Use the rules of probability to compute probabilities of compound events in a uniform probability model

6. Find the conditional probability of *A* given *B* as the fraction of *B*’s outcomes that also belong to *A*, and interpret the answer in terms of the model.

7. Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model.

8. (+) Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model.

9. (+) Use permutations and combinations to compute probabilities of compound events and solve problems.

Using Probability to Make Decisions S-MD

Calculate expected values and use them to solve problems

1. (+) Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.

2. (+) Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.

3. (+) Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value. *For example, find the theoretical probability distribution for the number of correct answers obtained by guessing on all five questions of a multiple-choice test where each question has four choices, and find the expected grade under various grading schemes.*

4. (+) Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value. *For example, find a current data distribution on the number of TV sets per household in the United States, and calculate the expected number of sets per household. How many TV sets would you expect to find in 100 randomly selected households?*

Use probability to evaluate outcomes of decisions

5. (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.

   a. Find the expected payoff for a game of chance. *For example, find the expected winnings from a state lottery ticket or a game at a fast-food restaurant.*
   b. Evaluate and compare strategies on the basis of expected values. *For example, compare a high-deductible versus a low-deductible automobile insurance policy using various, but reasonable, chances of having a minor or a major accident.*

6. (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).

7. (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).

Glossary

Addition and subtraction within 5, 10, 20, 100, or 1000. Addition or subtraction of two whole numbers with whole number answers, and with sum or minuend in the range 0-5, 0-10, 0-20, or 0-100, respectively. Example: 8 + 2 = 10 is an addition within 10, 14 – 5 = 9 is a subtraction within 20, and 55 – 18 = 37 is a subtraction within 100.

Additive inverses. Two numbers whose sum is 0 are additive inverses of one another. Example: 3/4 and – 3/4 are additive inverses of one another because 3/4 + (– 3/4) = (– 3/4) + 3/4 = 0.

Associative property of addition. See Table 3 in this Glossary.

Associative property of multiplication. See Table 3 in this Glossary.

Bivariate data. Pairs of linked numerical observations. Example: a list of heights and weights for each player on a football team. Box plot. A method of visually displaying a distribution of data values by using the median, quartiles, and extremes of the data set. A box shows the middle 50% of the data.[1]

Commutative property. See Table 3 in this Glossary.

Complex fraction. A fraction A/B where A and/or B are fractions (B nonzero).

Computation algorithm. A set of predefined steps applicable to a class of problems that gives the correct result in every case when the steps are carried out correctly. *See also:* computation strategy.

Computation strategy. Purposeful manipulations that may be chosen for specific problems, may not have a fixed order, and may be aimed at converting one problem into another. *See also:* computation algorithm.

Congruent. Two plane or solid figures are congruent if one can be obtained from the other by rigid motion (a sequence of rotations, reflections, and translations).

Counting on. A strategy for finding the number of objects in a group without having to count every member of the group. For example, if a stack of books is known to have 8 books and 3 more books are added to the top, it is not necessary to count the stack all over again. One can find the total by counting on—pointing to the top book and saying “eight,” following this with “nine, ten, eleven. There are eleven books now.”

Dot plot. *See*: line plot.

Dilation. A transformation that moves each point along the ray through the point emanating from a fixed center, and multiplies distances from the center by a common scale factor.

Expanded form. A multi-digit number is expressed in expanded form when it is written as a sum of single-digit multiples of powers of ten. For example, 643 = 600 + 40 + 3.

Expected value. For a random variable, the weighted average of its possible values, with weights given by their respective probabilities.

First quartile. For a data set with median M, the first quartile is the median of the data values less than M. Example: For the data set {1, 3, 6, 7, 10, 12, 14, 15, 22, 120}, the first quartile is 6.[2] *See also:* median, third quartile, interquartile range.

Fraction. A number expressible in the form a/b where a is a whole number and b is a positive whole number. (The word fraction in these standards always refers to a non-negative number.) *See also:* rational number.

Identity property of 0. See Table 3 in this Glossary.

Independently combined probability models. Two probability models are said to be combined independently if the probability of each ordered pair in the combined model equals the product of the original probabilities of the two individual outcomes in the ordered pair.

Integer. A number expressible in the form a or –a for some whole number a.

Interquartile Range. A measure of variation in a set of numerical data, the interquartile range is the distance between the first and third quartiles of the data set. Example: For the data set {1, 3, 6, 7, 10, 12, 14, 15, 22, 120}, the interquartile range is 15 – 6 = 9. *See also:* first quartile, third quartile.

Line plot. A method of visually displaying a distribution of data values where each data value is shown as a dot or mark above a number line. Also known as a dot plot.[3]

Mean. A measure of center in a set of numerical data, computed by adding the values in a list and then dividing by the number of values in the list.4 Example: For the data set {1, 3, 6, 7, 10, 12, 14, 15, 22, 120}, the mean is 21.

Mean absolute deviation. A measure of variation in a set of numerical data, computed by adding the distances between each data value and the mean, then dividing by the number of data values. Example: For the data set {2, 3, 6, 7, 10, 12, 14, 15, 22, 120}, the mean absolute deviation is 20.

Median. A measure of center in a set of numerical data. The median of a list of values is the value appearing at the center of a sorted version of the list—or the mean of the two central values, if the list contains an even number of values. Example: For the data set {2, 3, 6, 7, 10, 12, 14, 15, 22, 90}, the median is 11.

Midline. In the graph of a trigonometric function, the horizontal line halfway between its maximum and minimum values. Multiplication and division within 100. Multiplication or division of two whole numbers with whole number answers, and with product or dividend in the range 0-100. Example: 72 ÷ 8 = 9.

Multiplicative inverses. Two numbers whose product is 1 are multiplicative inverses of one another. Example: 3/4 and 4/3 are multiplicative inverses of one another because 3/4 × 4/3 = 4/3 × 3/4 = 1.

Number line diagram. A diagram of the number line used to represent numbers and support reasoning about them. In a number line diagram for measurement quantities, the interval from 0 to 1 on the diagram represents the unit of measure for the quantity.

Percent rate of change. A rate of change expressed as a percent. Example: if a population grows from 50 to 55 in a year, it grows by 5/50 = 10% per year.

Probability distribution. The set of possible values of a random variable with a probability assigned to each.

Properties of operations. See Table 3 in this Glossary.

Properties of equality. See Table 4 in this Glossary.

Properties of inequality. See Table 5 in this Glossary.

Properties of operations. See Table 3 in this Glossary.

Probability. A number between 0 and 1 used to quantify likelihood for processes that have uncertain outcomes (such as tossing a coin, selecting a person at random from a group of people, tossing a ball at a target, or testing for a medical condition).

Probability model. A probability model is used to assign probabilities to outcomes of a chance process by examining the nature of the process. The set of all outcomes is called the sample space, and their probabilities sum to 1. *See also:* uniform probability model.

Random variable. An assignment of a numerical value to each outcome in a sample space. Rational expression. A quotient of two polynomials with a non-zero denominator.

Rational number. A number expressible in the form a/b or – a/b for some fraction a/b. The rational numbers include the integers.

Rectilinear figure. A polygon all angles of which are right angles.

Rigid motion. A transformation of points in space consisting of a sequence of one or more translations, reflections, and/or rotations. Rigid motions are here assumed to preserve distances and angle measures.

Repeating decimal. The decimal form of a rational number. *See also:* terminating decimal.

Sample space. In a probability model for a random process, a list of the individual outcomes that are to be considered.

Scatter plot. A graph in the coordinate plane representing a set of bivariate data. For example, the heights and weights of a group of people could be displayed on a scatter plot.[5]

Similarity transformation. A rigid motion followed by a dilation.

Tape diagram. A drawing that looks like a segment of tape, used to illustrate number relationships. Also known as a strip diagram, bar model, fraction strip, or length model.

Terminating decimal. A decimal is called terminating if its repeating digit is 0.

Third quartile. For a data set with median M, the third quartile is the median of the data values greater than *M*. Example: For the data set {2, 3, 6, 7, 10, 12, 14, 15, 22, 120}, the third quartile is 15. *See also:* median, first quartile, interquartile range.

Transitivity principle for indirect measurement. If the length of object A is greater than the length of object B, and the length of object B is greater than the length of object C, then the length of object A is greater than the length of object C. This principle applies to measurement of other quantities as well.

Uniform probability model. A probability model which assigns equal probability to all outcomes. *See also:* probability model.

Vector. A quantity with magnitude and direction in the plane or in space, defined by an ordered pair or triple of real numbers.

Visual fraction model. A tape diagram, number line diagram, or area model.

Whole numbers. The numbers 0, 1, 2, 3,....

~~SCIENCE AND TECHNOLOGY~~

~~Science and technology provide people with the knowledge and tools to understand and address many of the challenges of a rapidly changing world. Students must be provided with opportunities to access, understand, and evaluate current information and tools related to science and technology if they are to be ready to live in a 21st century global society.~~

~~The study of science and technology includes both processes and bodies of knowledge. Scientific processes are the ways scientists investigate and communicate about the natural world. The scientific body of knowledge includes concepts, principles, facts, laws, and theories about the way the world around us works. Technology includes the technological design process and the body of knowledge related to the study of tools and the effect of technology on society.~~

~~Science and technology merge in the pursuit of knowledge and solutions to problems that require the application of scientific understanding and product design. Solving technological problems demands scientific knowledge while modern technologies make it possible to discover new scientific knowledge. In a world shaped by science and technology, it is important for students to learn how science and technology connect with the demands of society and the knowledge of all content areas. It is equally important that students are provided with learning experiences that integrate tools, knowledge, and processes of science and technology.~~

~~The Science and Technology Standards outline the essential understandings of these disciplines. Standard A describes four themes that serve as a broad scaffold for understanding and organizing student understanding of the content and processes of science and technology. Standard B describes the processes of scientific inquiry and technological design. As a complement to the expectations of inquiry and design outlined in Standard B, Standard C describes the enterprises of science and technology and the connection to society. Standards D and E have performance indicators that encompass the subject matter conventionally referred to as life, physical, and earth space science. It is essential that classroom instruction integrate the processes and ideas of Standards A, B, and C with the knowledge of Standards D and E, rather than teach them separately. Instruction should support students in asking questions and making inquiries to help them, understand and solve problems that require the integration of knowledge and processes in authentic contexts.~~

> ~~**Unifying Themes** - The proposed revised standards begin with a focus on four themes of science and technology: systems, models, and constancy and change, and scale. These themes provide teachers and students with a scaffold on which to organize the details of the standards. National standards documents identify these themes as critical knowledge for students in the 21st century.~~
>
> ~~**The Skills of Scientific Inquiry and Technological Design Process** - The Science and Technology Standards define both the student skills of scientific inquiry and the student skills of technological design. The inclusion of scientific inquiry, the development of a coherent section on technological design and the inclusion of a standard on scientific and technological enterprise highlight the importance of developing student understanding of the unique characteristics of and relationships between science and technology. The scientific and technological enterprise standard outlines key understandings about the relationships among science, technology and society and underscores the role of citizens in the decision-making process related to science and technology.~~

~~**OUTLINE OF SCIENCE AND TECHNOLOGY STANDARDS AND PERFORMANCE INDICATOR LABELS**~~

~~**A. Unifying Themes**~~
~~**1. Systems**~~
~~**2. Models**~~
~~**3. Constancy and Change**~~
~~**4. Scale**~~
~~**B. The Skills and Traits of Scientific Inquiry and Technological Design**~~
~~**1. Skills and Traits of Scientific Inquiry**~~
~~**2. Skills and Traits of Technological Design**~~
~~**C. The Scientific and Technological Enterprise**~~
~~**1. Understandings of Inquiry**~~
~~**2. Understandings about Science and Technology**~~
~~**3. Science, Technology, and Society**~~
~~**4. History and Nature of Science**~~
~~**D. The Physical Setting**~~
~~**1. Universe and Solar System**~~
~~**2. Earth**~~
~~**3. Matter and Energy**~~
~~**4. Force and Motion**~~
~~**E. The Living Environment**~~
~~**1. Biodiversity**~~
~~**2. Ecosystems**~~
~~**3. Cells**~~
~~**4. Heredity and Reproduction**~~
~~**5. Evolution**~~

~~**A. Unifying Themes: Students apply the principles of *systems*, *models*, constancy and change, and scale in science and technology.**~~

~~**A1 Systems**~~

~~**Performance Indicators & Descriptors**~~			
~~**Pre-K-2**~~	~~**3-5**~~	~~**6-8**~~	~~**9-Diploma**~~
~~**Students recognize that parts work together, and make up whole man-made and natural objects.**~~ ~~a. Explain that most man-made and natural objects are made of parts.~~ ~~b. Explain that when put together, parts can do things they could not do separately.~~	~~**Students explain interactions between parts that make up whole man-made and natural things.**~~ ~~a. Give examples that show how individual parts of organisms, ecosystems, or man-made structures can influence one another.~~ ~~b. Explain ways that things including organisms, ecosystems, or man-made structures may not work as well (or at all) if a part is missing, broken, worn out, mismatched, or misconnected.~~	~~**Students describe and apply principles of *systems* in man-made things, natural things, and processes.**~~ ~~a. Explain how individual parts working together in a *system* (including organisms, Earth systems, solar systems, or man-made structures) can do more than each part individually.~~ ~~b. Explain how the output of one part of a *system,* including waste products from manufacturing or organisms, can become the input of another part of a *system*.~~ ~~c. Describe how *systems* are nested and that *systems* may be thought of as containing subsystems (as well as being a subsystem of a larger *system*) and apply the understanding to analyze *systems*.~~	~~**Students apply an understanding of *systems* to explain and analyze man-made and natural phenomena.**~~ ~~a. Analyze a system using the principles of boundaries, subsystems, inputs, outputs, feedback, or the system's relation to other *systems* and design solutions to a *system* problem.~~ ~~b. Explain and provide examples that illustrate how it may not always be possible to predict the impact of changing some part of a man-made or natural *system*.~~

~~A2 Models~~

~~Performance Indicators & Descriptors~~			
~~Pre-K-2~~	**~~3-5~~**	**~~6-8~~**	**~~9-Diploma~~**
~~Students identify *models* and the objects they represent to learn about their features.~~ ~~a. Describe ways in which toys and pictures are like the real things they model.~~ ~~b. Use a *model* as a tool to describe the motion of objects or the features of plants and animals.~~	**~~Students use *models* to represent objects, processes, and events from the physical setting, the living environment, and the technological world.~~** ~~a. Represent the features of a real object, event, or process using *models* including geometric figures, number sequences, graphs, diagrams, sketches, maps, or three-dimensional figures and note ways in which those representations do (and do not) match features of the originals.~~	**~~Students use *models* to examine a variety of real-world phenomena from the physical setting, the living environment, and the technological world and compare advantages and disadvantages of various *models*.~~** ~~a. Compare different types of *models* that can be used to represent the same thing (including *models* of chemical reactions, motion, or cells) in order to match the purpose and complexity of a model to its use.~~ ~~b. Propose changes to *models* and explain how those changes may better reflect the real thing.~~	**~~Students evaluate the effectiveness of a *model* by comparing its predictions to actual observations from the physical setting, the living environment, and the technological world.~~**

~~A3 Constancy and Change~~

~~Performance Indicators & Descriptors~~			
~~Pre-K-2~~	**~~3-5~~**	**~~6-8~~**	**~~9-Diploma~~**
~~Students observe that in the physical setting, the living environment, and the technological world some things change over time and some things stay the same.~~	**~~Students identify and represent basic patterns of change in the physical setting, the living environment, and the technological world.~~** ~~a. Recognize patterns of change~~	**~~Students describe how patterns of change vary in physical, biological, and technological *systems*.~~** ~~a. Describe systems that are changing including ecosystems, Earth *systems*, and technologies.~~	**~~Students identify and analyze examples of constancy and change that result from varying types and rates of change in physical, biological, and technological systems with and without *counterbalances*.~~**

~~**Performance Indicators & Descriptors**~~			
~~**Pre-K-2**~~	~~**3-5**~~	~~**6-8**~~	~~**9-Diploma**~~
~~a. Describe the size, weight, color, or movement of things over varying lengths of time and note qualities that change or remain the same.~~	~~including steady, repetitive, irregular, or apparently unpredictable change.~~ ~~b. Make tables or graphs to represent changes.~~	~~b. Give examples of *systems* including ecosystems, Earth systems, and technologies that appear to be unchanging (even though things may be changing within the *system*) and identify any feedback mechanisms that may be modifying the changes.~~ ~~c. Describe rates of change and cyclic patterns using appropriate grade-level mathematics.~~	

~~**A4 Scale**~~

~~**Performance Indicators & Descriptors**~~			
~~**Pre-K-2**~~	~~**3-5**~~	~~**6-8**~~	~~**9-Diploma**~~
~~**Students observe differences in scale.**~~ ~~a. Compare significantly different sizes, weights, ages, and speeds of objects.~~	~~**Students use mathematics to describe scale for man-made and natural things.**~~ ~~a. Measure things to compare sizes, speeds, times, distances, and weights.~~ ~~b. Use fractions and multiples to make comparisons of scale.~~	~~**Students use scale to describe objects, phenomena, or processes related to Earth, space, matter, and mechanical and living *systems*.**~~ ~~a. Describe how some things change or work differently at different scales.~~ ~~b. Use proportions, averages, and ranges to describe small and large extremes of scale.~~	~~**Students apply understanding of scale to explain phenomena in physical, biological, and technological *systems*.**~~ ~~a. Describe how large changes of scale may change how physical and biological *systems* work and provide examples.~~ ~~b. Mathematically represent large magnitudes of scale.~~

~~**B.The Skills and Traits of Scientific Inquiry and *Technological Design*: Students plan, conduct, analyze data from and communicate results of in-depth scientific investigations; and they use a systematic process, tools, equipment, and a variety of materials to create a *technological design* and produce a solution or product to meet a specified need.**~~

~~**B1 Skills and Traits of Scientific Inquiry**~~

~~**Performance Indicators & Descriptors**~~			
~~**Pre-K-2**~~	~~**3-5**~~	~~**6-8**~~	~~**9-Diploma**~~
~~**Students conduct and communicate results of simple investigations.**~~ ~~a. Ask questions and make observations about objects, organisms, and events in the environment.~~ ~~b. Safely conduct simple investigations to answer questions.~~ ~~c.Use simple instruments with basic units of measurement to gather data and extend the senses.~~ ~~d. Know what constitutes evidence that can be used to construct a reasonable explanation.~~ ~~e. Use writing, speaking, and drawing to communicate investigations and explanations.~~	~~**Students plan, conduct, analyze data from, and communicate results of investigations, including *fair tests*.**~~ ~~a. Pose investigable questions and seek answers from reliable sources of scientific information and from their own investigations.~~ ~~b. Plan and safely conduct investigations including simple experiments that involve a *fair test*.~~ ~~c.Use simple equipment, tools, and appropriate metric units of measurement to gather data and extend the senses.~~ ~~d. Use data to construct and support a reasonable explanation.~~ ~~e. Communicate scientific procedures and explanations.~~	~~**Students plan, conduct, analyze data from, and communicate results of investigations, including simple experiments.**~~ ~~a. Identify questions that can be answered through scientific investigations.~~ ~~b. Design and safely conduct scientific investigations including experiments with controlled variables.~~ ~~c.Use appropriate tools, metric units, and techniques to gather, analyze, and interpret data.~~ ~~d. Use mathematics to gather, organize, and present data and structure convincing explanations.~~ ~~e. Use logic, critical reasoning and evidence to develop descriptions, explanations, predictions, and *models*.~~ ~~f.Communicate, critique, and analyze their own scientific work and the work of other students.~~	~~**Students methodically plan, conduct, analyze data from, and communicate results of in-depth scientific investigations, including experiments guided by a testable hypothesis.**~~ ~~a. Identify questions, concepts, and testable hypotheses that guide scientific investigations.~~ ~~b. Design and safely conduct methodical scientific investigations, including experiments with controls.~~ ~~c.Use statistics to summarize, describe, analyze, and interpret results.~~ ~~d. Formulate and revise scientific investigations and *models* using logic and evidence.~~ ~~e. Use a variety of tools and technologies to improve investigations and communications.~~ ~~f.Recognize and analyze alternative explanations and *models* using~~

~~**Performance Indicators & Descriptors**~~			
~~**Pre-K-2**~~	~~**3-5**~~	~~**6-8**~~	~~**9-Diploma**~~
			~~scientific criteria.~~ ~~g. Communicate and defend scientific ideas.~~

~~**B2 Skills and Traits of *Technological Design***~~

~~**Performance Indicators & Descriptors**~~			
~~**Pre-K-2**~~	~~**3-5**~~	~~**6-8**~~	~~**9-Diploma**~~
~~**Students use a simple design process and basic tools and materials to solve a problem or create a product.**~~ ~~a. Describe a design problem in their own words.~~ ~~b. Propose a way to build something or cause something to work better.~~ ~~c. Use suitable tools, materials, safe techniques, and measurements to implement a proposed solution to a design problem.~~ ~~d. Judge how well a product or design solved a problem.~~ ~~e. Present a design or solution to a problem using oral, written, or pictorial means of communication.~~	~~**Students use a design process, simple tools, and a variety of materials to solve a problem or create a product, recognizing the constraints that need to be considered.**~~ ~~a. Identify and explain a simple design problem and a solution related to the problem.~~ ~~b. Propose a solution to a design problem that recognizes constraints including cost, materials, time, space, or safety.~~ ~~c. Use appropriate tools, materials, safe techniques, and quantitative measurements to implement a proposed solution to a design problem.~~ ~~d. Balance simple constraints in carrying out a proposed solution to a design problem.~~ ~~e. Evaluate their own design results,~~	~~**Students use a systematic process, tools, equipment, and a variety of materials to design and produce a solution or product to meet a specified need, using established criteria.**~~ ~~a. Identify appropriate problems for *technological design*.~~ ~~b. Design a solution or product.~~ ~~c. Communicate a proposed design using drawings and simple *models*.~~ ~~d. Implement a proposed design.~~ ~~e. Evaluate a completed design or product.~~ ~~f. Suggest improvements for their own and others' designs and try out proposed modifications.~~ ~~g. Explain the design process including the stages of problem identification, solution design, implementation, and evaluation.~~	~~**Students use a systematic process, tools and techniques, and a variety of materials to design and produce a solution or product that meets new needs or improves existing designs.**~~ ~~a. Identify new problems or a current design in need of improvement.~~ ~~b. Generate alternative design solutions.~~ ~~c. Select the design that best meets established criteria.~~ ~~d. Use *models* and simulations as prototypes in the design planning process.~~ ~~e. Implement the proposed design solution.~~ ~~f. Evaluate the solution to a design problem and the consequences of that solution.~~ ~~g. Present the problem, design process, and solution to a design~~

~~**Performance Indicators & Descriptors**~~			
~~**Pre-K-2**~~	~~**3-5**~~	~~**6-8**~~	~~**9-Diploma**~~
	~~as well as those of others, using established criteria.~~ ~~f. Modify designs based on results of evaluations.~~ ~~g. Present the design problem, process, and design or solution using oral, written, and/or pictorial means of communication.~~		~~problem including models, diagrams, and demonstrations.~~

~~**C. The Scientific and Technological Enterprise: Students understand the history and nature of scientific knowledge and technology, the processes of inquiry and *technological design*, and the impacts science and technology have on society and the environment.**~~

~~**C1 Understandings of Inquiry**~~

~~**Performance Indicators & Descriptors**~~			
~~**Pre-K-2**~~	~~**3-5**~~	~~**6-8**~~	~~**9-Diploma**~~
~~**Students describe the use of questions and accurate communication in scientists' work.**~~ ~~a. Describe how scientific investigations involve asking and answering a question.~~ ~~b. Point out the importance of describing things and investigations accurately so others can learn about them or repeat them.~~	~~**Students describe how scientific investigations result in explanations that are communicated to other scientists.**~~ ~~a. Describe how scientists answer questions by developing explanations based on observations, evidence, and knowledge of the natural world.~~ ~~b. Describe how scientists make their explanations public.~~	~~**Students describe how scientists use varied and systematic approaches to investigations that may lead to further investigations.**~~ ~~a. Explain how the type of question informs the type of investigation.~~ ~~b. Explain why it is important to identify and control variables and replicate trials in experiments.~~ ~~c. Describe how scientists' analyses of findings can lead to new investigations.~~	~~**Students describe key aspects of scientific investigations: that they are guided by *scientific principles* and knowledge, that they are performed to test ideas, and that they are communicated and defended publicly.**~~ ~~a. Describe how hypotheses and past and present knowledge guide and influence scientific investigations.~~ ~~b. Describe how scientists defend their evidence and explanations using~~

~~Performance Indicators & Descriptors~~			
~~**Pre-K-2**~~	~~**3-5**~~	~~**6-8**~~	~~**9-Diploma**~~
			~~logical arguments and verifiable results.~~

~~**C2 Understandings About Science and Technology**~~

~~Performance Indicators & Descriptors~~			
~~**Pre-K-2**~~	~~**3-5**~~	~~**6-8**~~	~~**9-Diploma**~~
~~**Students recognize that people have always engaged in science and technology and that there is a difference between the natural and designed worlds.**~~ ~~a. Recognize that people have always had problems and invented tools and ways of doing things to solve problems.~~ ~~b. Distinguish between objects that occur in nature and objects that are man-made.~~	~~**Students describe why people use science and technology and how scientists and engineers work.**~~ ~~a. Describe how scientists seek to answer questions and explain the natural world.~~ ~~b. Describe how engineers seek solutions to problems through the design and production of products.~~	~~**Students understand and compare the similarities and differences between scientific inquiry and *technological design*.**~~ ~~a. Compare the process of scientific inquiry to the process of *technological design*.~~ ~~b. Explain how constraints and consequences impact scientific inquiry and *technological design*.~~	~~**Students explain how the relationship between scientific inquiry and *technological design* influences the advancement of ideas, products, and *systems*.**~~ ~~a. Provide an example that shows how science advances with the introduction of new technologies and how solving technological problems often impacts new scientific knowledge.~~ ~~b. Provide examples of how creativity, imagination, and a good knowledge base are required to advance scientific ideas and *technological design*.~~ ~~c. Provide examples that illustrate how technological solutions to problems sometimes lead to new problems or new fields of inquiry.~~

~~**C3 Science, Technology, and Society**~~

~~**Performance Indicators & Descriptors**~~			
~~**Pre-K-2**~~	~~**3-5**~~	~~**6-8**~~	~~**9-Diploma**~~
~~**No performance indicator.**~~ ~~Although no performance indicators are stated, students are expected to have instructional experiences that describe influences of science and technology on their own lives.~~	~~**Students identify and describe the influences of science and technology on people and the environment.**~~ ~~a. Explain how scientific and technological information can help people make safe and healthy decisions.~~ ~~b. Give examples of changes in the environment caused by natural or man-made influences.~~ ~~c. Explain that natural resources are limited, and that reusing, recycling, and reducing materials and using renewable resources is important.~~	~~**Students identify and describe the role of science and technology in addressing personal and societal challenges.**~~ ~~a. Describe how science and technology can help address societal challenges including population, natural hazards, sustainability, personal health and safety, and environmental quality.~~ ~~b. Identify personal choices that can either positively or negatively impact society including population, ecosystem sustainability, personal health, and environmental quality.~~ ~~c. Identify factors that influence the development and use of science and technology.~~	~~**Students describe the role of science and technology in creating and solving contemporary issues and challenges.**~~ ~~a. Explain how science and technology influence the *carrying capacity* and sustainability of the planet.~~ ~~b. Explain how ethical, societal, political, economic, and cultural factors influence personal health, safety, and the quality of the environment.~~ ~~c. Explain how ethical, societal, political, economic, religious, and cultural factors influence the development and use of science and technology.~~

~~**C4 History and Nature of Science**~~

~~**Performance Indicators & Descriptors**~~			
~~**Pre-K-2**~~	~~**3-5**~~	~~**6-8**~~	~~**9-Diploma**~~
~~**No performance indicator.**~~ ~~Although no performance indicators are stated, students are expected to have instructional experiences that~~	~~**No performance indicator.**~~ ~~Although no performance indicators are stated, students are expected to have instructional experiences that~~	~~**Students describe historical examples that illustrate how science advances knowledge through the scientists involved and through the ways scientists think**~~	~~**Students describe the human dimensions and traditions of science, the nature of scientific knowledge, and historical episodes in science that impacted science**~~

~~**Performance Indicators & Descriptors**~~			
~~**Pre-K-2**~~	~~**3-5**~~	~~**6-8**~~	~~**9-Diploma**~~
~~describe how people use science in their lives.~~	~~describe how science helps people understand the natural world.~~	~~**about their work and the work of others.**~~ ~~a. Describe how women and men of various backgrounds, working in teams or alone and communicating about their ideas extensively with others, engage in science, engineering, and related fields.~~ ~~b. Describe a breakthrough from the history of science that contributes to our current understanding of science.~~ ~~c. Describe and provide examples that illustrate that science is a human endeavor that generates explanations based on verifiable evidence that are subject to change when new evidence does not match existing explanations.~~	~~**and society.**~~ ~~a. Describe the ethical traditions in science including peer review, truthful reporting, and making results public.~~ ~~b. Select and describe one of the major episodes in the history of science including how the scientific knowledge changed over time and any important effects on science and society.~~ ~~c. Give examples that show how societal, cultural, and personal beliefs and ways of viewing the world can bias scientists.~~ ~~d. Provide examples of criteria that distinguish scientific explanations from pseudoscientific ones.~~

~~**D. The Physical Setting: Students understand the universal nature of matter, energy, force, and motion and identify how these relationships are exhibited in Earth Systems, in the solar system, and throughout the universe.**~~

~~**D1 Universe and Solar System**~~

~~**Performance Indicators & Descriptors**~~			
~~**Pre-K-2**~~	~~**3-5**~~	~~**6-8**~~	~~**9-Diploma**~~
~~**Students describe the movement of objects across the sky, as seen from Earth.**~~ ~~a. Describe how the sun and moon seem to move across the sky.~~ ~~b. Describe the changes in the appearance of the moon from day to day.~~	~~**Students describe the positions and apparent motions of different objects in and beyond our solar system and how these objects can be viewed from Earth.**~~ ~~a. Show the locations of the sun, Earth, moon, and planets and their orbits.~~ ~~b. Observe and report on observations that the sun appears to move across the sky in the same way every day, but its path changes slowly over the seasons.~~ ~~c. Recognize that the sun is a star and is similar to other stars in the universe.~~	~~**Students explain the movements and describe the location, composition, and characteristics of our solar system and universe, including planets, the sun, and galaxies.**~~ ~~a. Describe the different kinds of objects in the solar system including planets, sun, moons, asteroids, and comets.~~ ~~b. Explain the motions that cause days, years, phases of the moon, and eclipses.~~ ~~c. Describe the location of our solar system in its galaxy and explain that other galaxies exist and that they include stars and planets.~~	~~**Students explain the physical formation and changing nature of our universe and solar system, and how our past and present knowledge of the universe and solar system developed.**~~ ~~a. Explain why the unit of light years can be used to describe distances to objects in the universe and use light years to describe distances.~~ ~~b. Explain the role of gravity in forming and maintaining planets, stars, and the solar system.~~ ~~c. Outline the age, origin, and process of formation of the universe as currently understood by science.~~ ~~d. Describe the major events that have led to our current understanding of the universe and the current technologies used to further our understanding.~~

~~**D2 Earth**~~

~~**Performance Indicators & Descriptors**~~			
~~**Pre-K-2**~~	~~**3-5**~~	~~**6-8**~~	~~**9-Diploma**~~
~~**Students describe Earth's weather**~~	~~**Students describe the properties of**~~	~~**Students describe the various**~~	~~**Students describe and analyze the**~~

~~Performance Indicators & Descriptors~~			
~~**Pre-K-2**~~	~~**3-5**~~	~~**6-8**~~	~~**9-Diploma**~~
~~**and surface materials and the different ways they change.**~~ ~~a. Explain that the sun warms the air, water, and land.~~ ~~b. Describe the way in which weather changes over months.~~ ~~c. Describe what happens to water left in an open container as compared to water left in a closed container.~~	~~**Earth's surface materials, the processes that change them, and cycles that affect the Earth.**~~ ~~a. Explain the effects of the rotation of Earth on the day/night cycle, and how that cycle affects local temperature.~~ ~~b. Describe the various forms water takes in the air and how that relates to weather.~~ ~~c. Explain how wind, waves, water, and ice reshape the surface of Earth.~~ ~~d. Describe the kinds of materials that form rocks and soil.~~ ~~e. Recognize that the sun is the source of Earth's surface heat and light energy.~~ ~~f. Explain how the substance called air surrounds things, takes up space, and its movement can be felt as wind.~~	~~**cycles, physical and biological forces and processes, position in space, energy transformations, and human actions that affect the short-term and long-term changes to the Earth.**~~ ~~a. Explain how the tilt of Earth's rotational axis relative to the plane of its yearly orbit around the sun affects the day length and sunlight intensity to cause seasons.~~ ~~b. Describe Earth Systems - biosphere, atmosphere, hydrosphere and lithosphere - and cycles and interactions within them (including water moving among and between them, rocks forming and transforming, and weather formation).~~ ~~c. Give several reasons why the climate is different in different regions of the Earth.~~ ~~d. Describe significant Earth resources and how their limited supply affects how they are used.~~ ~~e. Describe the effect of gravity on objects on Earth.~~ ~~f. Give examples of abrupt changes and slow changes in Earth Systems.~~	~~**biological, physical, energy, and human influences that shape and alter Earth Systems.**~~ ~~a. Describe and analyze the effect of solar radiation, ocean currents, and atmospheric conditions on the Earth's surface and the habitability of Earth.~~ ~~b. Describe Earth's internal energy sources and their role in plate tectonics.~~ ~~c. Describe and analyze the effects of biological and geophysical influences on the origin and changing nature of Earth Systems.~~ ~~d. Describe and analyze the effects of human influences on Earth Systems.~~

~~D3 Matter and Energy~~

~~Performance Indicators & Descriptors~~			
~~Pre-K-2~~	**~~3-5~~**	**~~6-8~~**	**~~9-Diploma~~**
~~Students use observable characteristics to describe objects and materials and changes to physical properties of materials.~~ ~~a. Describe objects in terms of what they are made of and their physical properties.~~ ~~b. Describe changes in properties of materials when mixed, heated, frozen, or cut.~~	**~~Students describe properties of objects and materials before and after they undergo a change or interaction.~~** ~~a. Describe how the weight of an object compares to the sum of the weight of its parts.~~ ~~b. Illustrate how many different substances can be made from a small number of basic ingredients.~~ ~~c. Describe properties of original materials, and the new material(s) formed, to demonstrate that a change has occurred.~~ ~~d. Describe what happens to the temperatures of objects when a warmer object is near a cooler object.~~ ~~e. Describe how the heating and cooling of water and other materials can change the properties of the materials.~~ ~~f. Explain that the properties of a material may change but the total amount of material remains the same.~~ ~~g. Explain that materials can be~~	**~~Students describe physical and chemical properties of matter, interactions and changes in matter, and transfer of energy through matter.~~** ~~a. Describe that all matter is made up of atoms and distinguish between/among elements, atoms, and molecules.~~ ~~b. Describe how physical characteristics of elements and types of reactions they undergo have been used to create the Periodic Table.~~ ~~c. Describe the difference between physical and chemical change.~~ ~~d. Explain the relationship of the motion of atoms and molecules to the states of matter for gases, liquids, and solids.~~ ~~e. Explain how atoms are packed together in arrangements that compose all substances including elements, compounds, mixtures, and solutions.~~ ~~f. Explain and apply the understanding that substances have~~	**~~Students describe the structure, behavior, and interactions of matter at the atomic level and the relationship between matter and energy.~~** ~~a. Describe the structure of atoms in terms of neutrons, protons, and electrons and the role of the atomic structure in determining chemical properties.~~ ~~b. Describe how the number and arrangement of atoms in a molecule determine a molecule's properties, including the types of bonds it makes with other molecules and its mass, and apply this to predictions about chemical reactions.~~ ~~c. Explain the essential roles of carbon and water in life processes.~~ ~~d. Describe how light is emitted and absorbed by atoms' changing energy levels, and how the results can be used to identify a substance.~~ ~~e. Describe factors that affect the rate of chemical reactions (including~~

~~**Performance Indicators & Descriptors**~~			
~~**Pre-K-2**~~	~~**3-5**~~	~~**6-8**~~	~~**9-Diploma**~~
	~~composed of parts too small to be seen without magnification.~~	~~characteristic properties, including density, boiling point, and solubility and these properties are not dependent on the amount of matter present.~~ ~~g. Use the idea of atoms to explain the conservation of matter.~~ ~~h. Describe several different types of energy forms including heat energy, chemical energy, and mechanical energy.~~ ~~i. Use examples of energy transformations from one form to another to explain that energy cannot be created or destroyed.~~ ~~j. Describe how *heat* is transferred from one object to another by conduction, convection, and/or radiation.~~ ~~k. Describe the properties of solar radiation and its interaction with objects on Earth.~~	~~concentration, pressure, temperature, and the presence of molecules that encourage interaction with other molecules).~~ ~~f. Apply an understanding of the factors that affect the rate of chemical reaction to predictions about the rate of chemical reactions.~~ ~~g. Describe nuclear reactions, including fusion and fission, and the energy they release.~~ ~~h. Describe radioactive decay and half-life.~~ ~~i. Explain the relationship between kinetic and potential energy and apply the knowledge to solve problems.~~ ~~j. Describe how in energy transformations the total amount of energy remains the same, but because of inefficiencies (*heat*, sound, and vibration) useful energy is often lost through radiation or conduction.~~ ~~k. Apply an understanding of energy transformations to solve problems.~~ ~~l. Describe the relationship among *heat*, *temperature*, and pressure in terms of the actions of atoms, molecules, and ions.~~

~~D4 Force and Motion~~

~~Performance Indicators & Descriptors~~			
~~Pre-K-2~~	**~~3-5~~**	**~~6-8~~**	**~~9-Diploma~~**
~~Students describe how objects move in different ways.~~ ~~a. Describe different ways things move and what it takes to start objects moving, keep objects moving, or stop objects.~~ ~~b. Give examples of things that make sound by vibrating.~~	**~~Students summarize how various forces affect the motion of objects.~~** ~~a. Predict the effect of a given force on the motion of an object.~~ ~~b. Describe how fast things move by how long it takes them to go a certain distance.~~ ~~c. Describe the path of an object.~~ ~~d. Give examples of how gravity, magnets, and electrically charged materials push and pull objects.~~	**~~Students describe the force of gravity, the motion of objects, the properties of waves, and the wavelike property of energy in light waves.~~** ~~a. Describe the similarities and differences in the motion of sound vibrations, earthquakes, and light waves.~~ ~~b. Explain the relationship among visible light, the electromagnetic spectrum, and sight.~~ ~~c. Describe and apply an understanding of how the gravitational force between any two objects would change if their mass or the distance between them changed.~~ ~~d. Describe and apply an understanding of how electric currents and magnets can exert force on each other.~~ ~~e. Describe and apply an understanding of the effects of multiple forces on an object, and how unbalanced forces will cause changes in the speed or direction.~~	**~~Students understand that the laws of force and motion are the same across the universe.~~** ~~a. Describe the contribution of Newton to our understanding of force and motion, and give examples of and apply Newton's three laws of motion and his theory of gravitation.~~ ~~b. Explain and apply the ideas of relative motion and frame of reference.~~ ~~c. Describe the relationship between electric and magnetic fields and forces, and give examples of how this relationship is used in modern technologies.~~ ~~d. Describe and apply characteristics of waves including wavelength, frequency, and amplitude.~~ ~~e. Describe and apply an understanding of how waves interact with other waves and with materials including reflection, refraction, and absorption.~~ ~~f. Describe kinetic energy (the energy of motion), potential energy (dependent on relative position),~~

~~**Performance Indicators & Descriptors**~~			
~~**Pre-K-2**~~	~~**3-5**~~	~~**6-8**~~	~~**9-Diploma**~~
			~~and energy contained by a field (including electromagnetic waves) and apply these understandings to energy problems.~~

~~**E. The Living Environment: Students understand that cells are the basic unit of life, that all life as we know it has evolved through genetic transfer and natural selection to create a great diversity of organisms, and that these organisms create interdependent webs through which matter and energy flow. Students understand similarities and differences between humans and other organisms and the interconnections of these interdependent webs.**~~

~~**E1 Biodiversity**~~

~~**Performance Indicators & Descriptors**~~			
~~**Pre-K-2**~~	~~**3-5**~~	~~**6-8**~~	~~**9-Diploma**~~
~~**Students describe similarities and differences in the observable behaviors, features, and needs of plants and animals.**~~ ~~a. Describe similarities and differences in the way plants and animals look and the things that they do.~~ ~~b. Describe some features of plants and animals that help them live in different environments.~~ ~~c. Describe how organisms change during their lifetime.~~	~~**Students compare living things based on their behaviors, external features, and environmental needs.**~~ ~~a. Describe how living things can be sorted in many ways, depending on which features or behaviors are used to sort them, and apply this understanding to sort living things.~~ ~~b. Describe the changes in external features and behaviors of an organism during its life cycle.~~	~~**Students differentiate among organisms based on biological characteristics and identify patterns of similarity.**~~ ~~a. Compare physical characteristics that differentiate organisms into groups (including plants that use sunlight to make their own food, animals that consume energy-rich food, and organisms that cannot easily be classified as either).~~ ~~b. Explain how biologists use internal and external anatomical features to determine relatedness among organisms and to form the basis~~	~~**Students describe and analyze the evidence for relatedness among and within diverse populations of organisms and the importance of biodiversity.**~~ ~~a. Explain how the variation in structure and behavior of a population of organisms may influence the likelihood that some members of the species will have adaptations that allow them to survive in a changing environment.~~ ~~b. Describe the role of DNA sequences in determining the degree of~~

~~Performance Indicators & Descriptors~~			
~~Pre-K-2~~	~~3-5~~	~~6-8~~	~~9-Diploma~~
		~~for classification *systems*.~~ ~~c. Explain ways to determine whether organisms are the same species.~~ ~~d. Describe how external and internal structures of animals and plants contribute to the variety of ways organisms are able to find food and reproduce.~~	~~kinship among organisms and the identification of species.~~ ~~c. Analyze the relatedness among organisms using structural and molecular evidence.~~ ~~d. Analyze the effects of changes in biodiversity and predict possible consequences.~~

~~E2 Ecosystems~~

~~Performance Indicators & Descriptors~~			
~~Pre-K-2~~	~~3-5~~	~~6-8~~	~~9-Diploma~~
~~Students understand how plants and animals depend on each other and the environment in which they live.~~ ~~a. Explain that animals use plants and other animals for food, shelter, and nesting.~~ ~~b. Compare different animals and plants that live in different environments of the world.~~	**~~Students describe ways organisms depend upon, interact within, and change the living and non-living environment as well as ways the environment affects organisms.~~** ~~a. Explain how changes in an organism's habitat can influence its survival.~~ ~~b. Describe that organisms all over the Earth are living, dying, and decaying and new organisms are being produced by the old ones.~~ ~~c. Describe some of the ways in which organisms depend on one another, including animals carrying pollen and~~	**~~Students examine how the characteristics of the physical, non-living (abiotic) environment, the types and behaviors of living (biotic) organisms, and the flow of matter and energy affect organisms and the ecosystem of which they are part.~~** ~~a. List various kinds of resources within different biomes for which organisms compete.~~ ~~b. Describe ways in which two types of organisms may interact (including competition, predator/prey, producer/consumer/decomposer, parasitism, and mutualism) and describe the positive and negative~~	**~~Students describe and analyze the interactions, cycles, and factors that affect short-term and long-term ecosystem stability and change.~~** ~~a. Explain why ecosystems can be reasonably stable over hundreds or thousands of years, even though populations may fluctuate.~~ ~~b. Describe dynamic equilibrium in ecosystems and factors that can, in the long run, lead to change in the normal pattern of cyclic fluctuations and apply that knowledge to actual situations.~~ ~~c. Explain the concept of *carrying capacity* and list factors that~~

~~**Performance Indicators & Descriptors**~~			
~~**Pre-K-2**~~	~~**3-5**~~	~~**6-8**~~	~~**9-Diploma**~~
	~~dispersing seeds.~~ ~~d. Explain how the food of most animals can be traced back to plants and how animals use food for energy and repair.~~ ~~e. Explain how organisms can affect the environment in different ways.~~	~~consequences of such interactions.~~ ~~c. Describe the source and flow of energy in the two major food webs, terrestrial and marine.~~ ~~d. Describe how matter and energy change from one form to another in living things and in the physical environment.~~ ~~e. Explain that the total amount of matter in the environment stays the same even as its form and location change.~~	~~determine the amount of life that any environment can support.~~ ~~d. Describe the critical role of photosynthesis and how energy and the chemical elements that make up molecules are transformed in ecosystems and obey basic conservation laws.~~

~~E3 Cells~~

~~**Performance Indicators & Descriptors**~~			
~~**Pre-K-2**~~	~~**3-5**~~	~~**6-8**~~	~~**9-Diploma**~~
~~**Students describe parts and wholes of living things, their basic needs, and the structures and processes that help them stay alive.**~~ ~~a. List living things and their parts. Explain that parts of living things that are so small we can only see them using magnifiers.~~ ~~b. List the basic things that most organisms need to survive.~~ ~~c. Identify structures that help organisms do things to stay alive.~~	~~**Students describe how living things are made up of one or more cells and the ways cells help organisms meet their basic needs.**~~ ~~a. Give examples of organisms that consist of a single cell and organisms that are made of a collection of cells.~~ ~~b. Compare how needs of living things are met in single-celled and multi-celled organisms.~~	~~**Students describe the hierarchy of organization and function in organisms, and the similarities and differences in structure, function, and needs among and within organisms.**~~ ~~a. Describe the basic functions of organisms carried out within cells including the extracting of energy from food and the elimination of wastes.~~ ~~b. Explain the relationship among cells, tissues, organs, and organ~~	~~**Students describe structure and function of cells at the intracellular and molecular level including differentiation to form *systems*, interactions between cells and their environment, and the impact of cellular processes and changes on individuals.**~~ ~~a. Describe the similarities and differences in the basic functions of cell membranes and of the specialized parts within cells that allow them to transport materials,~~

Performance Indicators & Descriptors			
~~Pre-K-2~~	~~3-5~~	~~6-8~~	~~9-Diploma~~
		~~*systems*, including how tissues and organs serve the needs of cells and organisms.~~ ~~c. Compare the structures, *systems*, and interactions that allow single-celled organisms and multi-celled plants and animals, including humans, to defend themselves, acquire and use energy, self-regulate, reproduce, and coordinate movement.~~ ~~d. Explain that all living things are composed of cells numbering from just one to millions.~~	~~capture and release energy, build proteins, dispose of waste, communicate, and move.~~ ~~b. Describe the relationship among DNA, protein molecules, and amino acids in carrying out the work of cells and how this is similar among all organisms.~~ ~~c. Describe the interactions that lead to cell growth and division (mitosis) and allow new cells to carry the same information as the original cell (meiosis).~~ ~~d. Describe ways in which cells can malfunction and put an organism at risk.~~ ~~e. Describe the role of regulation and the processes that maintain an internal environment amidst changes in the external environment.~~ ~~f. Describe the process of metabolism that allows a few key biomolecules to provide cells with necessary materials to perform their functions.~~ ~~g. Describe how cells differentiate to form specialized *systems* for carrying out life functions.~~

~~E4 Heredity and Reproduction~~

~~Performance Indicators & Descriptors~~			
~~Pre-K-2~~	**~~3-5~~**	**~~6-8~~**	**~~9-Diploma~~**
~~Students describe the cycle of birth, development, and death in different organisms and the ways in which organisms resemble their parents.~~ ~~a. Give examples of how organisms are like their parents and not like them.~~ ~~b. Describe the life cycle of a plant or animal (including being born, growing, reproducing, and dying).~~	**~~Students describe characteristics of organisms, and the reasons why organisms differ from or are similar to their parents.~~** ~~a. Name some likenesses between children and parents that are inherited, and some that are not.~~ ~~b. Explain that in order for offspring to look like their parents, information related to inherited likenesses must be handed from parents to offspring in a reliable manner.~~	**~~Students describe the general characteristics and mechanisms of reproduction and heredity in organisms, including humans, and ways in which organisms are affected by their genetic traits.~~** ~~a. Explain that sexual reproduction includes fertilization that results in the inclusion of genetic information from each parent and determines the inherited traits that are a part of every cell.~~ ~~b. Identify some of the risks to the healthy development of an embryo including mother's diet, lifestyle, and hygiene.~~ ~~c. Describe asexual reproduction as a process by which all genetic information comes from one parent and determines the inherited traits that are a part of every cell.~~	**~~Students examine the role of DNA in transferring traits from generation to generation, in differentiating cells, and in evolving new species.~~** ~~a. Explain some of the effects of the sorting and recombination of genes in sexual reproduction.~~ ~~b. Describe genes as segments of DNA that contain instructions for the cells and include information that leads to the differentiation of cells.~~ ~~c. Explain how the instructions in DNA that lead to cell differentiation result in varied cell functions in the organism and DNA.~~ ~~d. Describe the possible causes and effects of gene mutations.~~

~~E5 Evolution~~

~~Performance Indicators & Descriptors~~			
~~Pre-K-2~~	**~~3-5~~**	**~~6-8~~**	**~~9-Diploma~~**
~~Students describe similarities and~~	**~~Students describe the fossil~~**	**~~Students describe the evidence~~**	**~~Students describe the interactions~~**

~~Performance Indicators & Descriptors~~			
~~Pre-K-2~~	**~~3-5~~**	**~~6-8~~**	**~~9-Diploma~~**
~~differences between present day and past organisms that helped the organisms live in their environment.~~ ~~a. Describe some organisms' features that allow the organisms to live in places others cannot.~~ ~~b. Explain how some kinds of organisms that once lived on Earth have completely disappeared, although they were similar to some that are alive today.~~	**~~evidence and present explanations that help us understand why there are differences among and between present and past organisms.~~** ~~a. Explain advantages and disadvantages gained when some individuals of the same kind are different in their characteristics and behavior.~~ ~~b. Compare fossils to one another and to living organisms according to their similarities and differences.~~	**~~that evolution occurs over many generations, allowing species to acquire many of their unique characteristics or adaptations.~~** ~~a. Explain how the layers of sedimentary rock and their contained fossils provide evidence for the long history of Earth and for the long history of changing life.~~ ~~b. Describe how small differences between parents and offspring can lead to descendants who are very different from their ancestors.~~ ~~c. Describe how variations in the behavior and traits of an offspring may permit some of them to survive a changing environment.~~ ~~d. Explain that new varieties of cultivated plants and domestic animals can be developed through genetic modification and describe the impacts of the new varieties of plants and animals.~~	**~~between and among species, populations, and environments that lead to natural selection and evolution.~~** ~~a. Describe the premise of biological evolution, citing evidence from the fossil record and evidence based on the observation of similarities within the diversity of existing organisms.~~ ~~b. Describe the origins of life and how the concept of natural selection provides a mechanism for evolution that can be advantageous or disadvantageous to the next generation.~~ ~~c. Explain why some organisms may have characteristics that have no apparent survival or reproduction advantage.~~ ~~d. Relate structural and behavioral adaptations of an organism to its survival in the environment.~~

SCIENCE

Introduction:
The science standards that follow were developed by Achieve and 26 lead states as part of the Next Generation Science Standards project. Maine participated as a lead state in that effort. These standards were guided by the National Research Council report, A Framework for K-12 Science Education. The science standards are distinct from prior science standards in three essential ways.
1) Performance. Prior standards documents listed what students should "know" or "understand." These ideas needed to be translated into performances that could be assessed to determine whether or not students met the standard. Different interpretations sometimes resulted in assessments that were not aligned with curriculum and instruction. These standards avoid this difficulty by developing *performance expectations* that state what students should be able to do in order to demonstrate that they have met the standard, thus providing the same clear and specific targets for curriculum, instruction, and assessment.
2) Foundations. Each performance expectation incorporates all three dimensions from the *Framework*— a science or engineering practice, a core disciplinary idea, and a crosscutting concept.
3) Coherence. Each set of performance expectations makes connections to other ideas within the disciplines of science and engineering, and with Common Core State Standards in Mathematics and English Language Arts.

Performance Expectations

Performance expectations are the assessable statements of what students should know and be able to do. Some states consider these performance expectations alone to be "the standards," while other states also include the content of the three foundation boxes and connections to be included in "the standard." Maine has elected to include the performance expectations, clarification statements and assessment boundaries. Educators can access the NGSS performance expectations and foundation boxes at The performance expectations were written to communicate a "big idea" that combined content from the three dimensions found in the *Framework*. The following is a list of the disciplinary core ideas around which the performance expectations are organized. Educators can access the Next Generation Science Standards and additional support materials at http://www.nextgenscience.org/next-generation-science-standards

Physical Science
Life Science
Earth and Space Science
PS1 Matter and Its Interactions
PS1A Structure and Properties of matter
PS1B Chemical Reactions
PS1C Nuclear Processes
PS2 Motion and Stability: Forces and Interactions
PS2A Forces and Motion PS2B Types of Interactions
PS2C Stability and Instability in Physical Systems
PS3 Energy
PS3A Definitions of Energy

PS3B Conservation of Energy and Energy Transfer
PS3C Relationship Between Energy and Forces
PS3D Energy and Chemical Processes in Everyday Life
PS4 Waves and Their Applications in Technologies for Information Transfer
PS4A Wave Properties
PS4B Electromagnetic Radiation
PS4C Information Technologies and Instrumentation
LS1 From Molecules to Organisms: Structures and Processes
LS1A Structure and Function
LS1B Growth and Development of Organisms
LS1C Organization for Matter and Energy Flow in Organisms
LS1D Information Processing
LS2 Ecosystems: Interactions, Energy, and Dynamics
LS2A Interdependent Relationships in Ecosystems
LS2B Cycles of Matter and Energy Transfer in Ecosystems
LS2C Ecosystem Dynamics, Functioning, and Resilience
LS2D Social Interactions and Group Behavior
LS3 Heredity: Inheritance and Variation of Traits
LS3A Inheritance of Traits
LS3B Variation of Traits
LS4 Biological Evolution: Unity and Diversity
LS4A Evidence of Common Ancestry LS4B Natural Selection LS4C Adaptation LS4D Biodiversity and Humans

Elementary Standards

Students in kindergarten through fifth grade begin to develop an understanding of the four disciplinary core ideas: physical sciences; life sciences; earth and space sciences; and engineering, technology, and applications of science. In the earlier grades, students begin by recognizing patterns and formulating answers to questions about the world around them. By the end of fifth grade, students are able to demonstrate grade-appropriate proficiency in gathering, describing, and using information about the natural and designed world(s). The performance expectations in elementary school grade bands develop ideas and skills that will allow students to explain more complex phenomena in the four disciplines as they progress to middle school and high school. While the performance expectations shown in kindergarten through fifth grade couple particular practices with specific disciplinary core ideas, instructional decisions should include use of many practices that lead to the performance expectations.

Kindergarten

The performance expectations in kindergarten help students formulate answers to questions such as: "What happens if you push or pull an object harder? Where do animals live and why do they live there? What is the weather like today and how is it different from yesterday?" Kindergarten performance expectations include PS2, PS3, LS1, ESS2, ESS3, and ETS1 Disciplinary Core Ideas from the NRC Framework. Students are expected to develop understanding of patterns and variations in local weather and the purpose of weather forecasting to prepare for, and respond to, severe weather. Students are able to apply an understanding of the effects of different strengths or different directions of pushes and pulls on the motion of an object to analyze a design solution. Students are also expected to develop understanding of what plants and animals (including humans) need to survive and the relationship between their needs and where they live. The crosscutting concepts of patterns; cause and effect; systems and system models; interdependence of science, engineering, and technology; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. In the kindergarten performance expectations, students are expected to demonstrate grade-appropriate proficiency in asking questions, developing and using models, planning and carrying out investigations, analyzing and interpreting data, designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

First Grade

The performance expectations in first grade help students formulate answers to questions such as: "What happens when materials vibrate? What happens when there is no light? What are some ways plants and animals meet their needs so that they can survive and grow? How are parents and their children similar and different? What objects are in the sky and how do they seem to move?" First grade performance expectations include PS4, LS1, LS3, and ESS1 Disciplinary Core Ideas from the NRC Framework. Students are expected to develop understanding of the relationship between sound and vibrating materials as well as between the availability of light and ability to see objects. The idea that light travels from place to place can be understood by students at this level through determining the effect of placing objects made with different materials in the path of a beam of light. Students are also expected to develop understanding of how plants and animals use their external parts to help them survive, grow, and meet their needs as well as how behaviors of parents and offspring help the offspring survive. The understanding is developed that young plants and animals are like, but not exactly the same as, their parents. Students are able to observe, describe, and predict some patterns of the movement of objects in the sky. The crosscutting concepts of patterns; cause and effect; structure and function; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. In the first grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in planning and carrying out investigations, analyzing and interpreting data, constructing explanations and designing solutions, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

Second Grade

The performance expectations in second grade help students formulate answers to questions such as: "How does land change and what are some things that cause it to change? What are the different kinds of land and bodies of water? How are materials similar and different from one another, and how do the properties of the materials relate to their use? What do plants need to grow? How many types of living things live in a place?" Second grade performance expectations include PS1, LS2, LS4, ESS1, ESS2, and ETS1 Disciplinary Core Ideas from the NRC Framework. Students are expected to develop an understanding of what plants need to grow and how plants depend on animals for seed dispersal and pollination. Students are also expected to compare the diversity of life in different habitats. An understanding of observable properties of materials is developed by students at this level through analysis and classification of different materials. Students are able to apply their understanding of the idea that wind and water can change the shape of the land to compare design solutions to slow or prevent such change. Students are able to use information and models to identify and represent the shapes and kinds of land and bodies of water in an area and where water is found on Earth. The crosscutting concepts of patterns; cause and effect; energy and matter; structure and function; stability and change; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. In the second grade performance expectations, students are expected to demonstrate grade- appropriate proficiency in developing and using models, planning and carrying out investigations, analyzing and interpreting data, constructing explanations and designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

Physical Science

Grade K students: | **Grade 1 students:** | **Grade 2 students:**

Physical Science: *PS1 Matter and Its Interactions; PS2 Motion and Stability: Forces and Interactions; PS3 Energy; PS4 Wave Properties*

Students who demonstrate understanding can:

Grade K students:

PS2 Motion and Stability: Forces and Interactions

KPS2-1 Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. [Clarification Statement: Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other.] [Assessment Boundary: Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include non-contact pushes or pulls such as those produced by magnets.]

KPS2-2 Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.* [Clarification Statement: Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn.] [Assessment Boundary: Assessment does not include friction as a mechanism for change in speed.]

PS3 Energy

KPS3-1 Make observations to determine the effect of sunlight on Earth's surface. [Clarification Statement: Examples of Earth's surface could include sand, soil, rocks, and water] [Assessment Boundary: Assessment of temperature is limited to relative measures such as warmer/cooler.]

KPS3-2 Use tools and materials to design and build structure that will reduce the warming effect of sunlight on an area.* [Clarification Statement: Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the sun.]

Grade 1 students:

PS4 Wave Properties

1PSP4-1 Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate. [Clarification Statement: Examples of vibrating materials that make sound could include tuning forks and plucking a stretched string. Examples of how sound can make matter vibrate could include holding a piece of paper near a speaker making sound and holding an object near a vibrating tuning fork.]

1PSP4-2 Make observations to construct an evidence-based account that objects can be seen only when illuminated. [Clarification Statement: Examples of observations could include those made in a completely dark room, a pinhole box, and a video of a cave explorer with a flashlight. Illumination could be from an external light source or by an object giving off its own light.]

1PSP4-3 Plan and conduct an investigation to determine the effect of placing objects made with different materials in the path of a beam of light. [Clarification Statement: Examples of materials could include those that are transparent (such as clear plastic), translucent (such as wax paper), opaque (such as cardboard), and reflective (such as a mirror).] [Assessment Boundary: Assessment does not include the speed of light.]

1PSP4-4 Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance.* [Clarification Statement: Examples of devices could include a light source to send signals, paper cup and string "telephones," and a pattern of drum beats.] [Assessment Boundary: Assessment does not include technological details for how communication devices work.]

f.

Grade 2 students:

PS1 Matter and Its Interactions

2-PS1-1 Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties. [Clarification Statement: Observations could include color, texture, hardness, and flexibility. Patterns could include the similar properties that different materials share.]

2-PS1-2 Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.* [Clarification Statement: Examples of properties could include, strength, flexibility, hardness, texture, and absorbency.] [Assessment Boundary: Assessment of quantitative measurements is limited to length.]

2-PS1-3 Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object. [Clarification Statement: Examples of pieces could include blocks, building bricks, or other assorted small objects.]

2-PS2-4 Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot. [Clarification Statement: Examples of reversible changes could include materials such as water and butter at different temperatures. Examples of irreversible changes could include cooking an egg, freezing a plant leaf, and heating paper.]

Life Science

Grade K students:	Grade 1 students:	Grade 2 students:
***Life Science**: LS1From Molecules to Organisms: Structures and Processes; LS2 Ecosystems: Interactions, Energy, and Dynamics; LS3 Heredity: Inheritance and Variation of Traits; LS4 Biological Evolution: Unity and Diversity* *Students who demonstrate understanding can:*		
From Molecules to Organisms: Structures and Processes; **K-LS1-1 Use observations to describe patterns of what plants and animals (including humans) need to survive.** [Clarification Statement: Examples of patterns could include that animals need to take in food but plants do not; the different kinds of food needed by different types of animals; the requirement of plants to have light; and that all living things need water.]	*From Molecules to Organisms: Structures and Processes;* **1-LS1-1 Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.*** [Clarification Statement: Examples of human problems that can be solved by mimicking plant or animal solutions could include designing clothing or equipment to protect bicyclists by mimicking turtle shells, acorn shells, and animal scales; stabilizing structures by mimicking animal tails and roots on plants; keeping out intruders by mimicking thorns on branches and animal quills; **1-LS1-2 Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive.** [Clarification Statement: Examples of patterns of behaviors could include the signals that offspring make (such as crying, cheeping, and other vocalizations) and the responses of the parents (such as feeding, comforting, and protecting the offspring).] *Heredity: Inheritance and Variation of Traits* **1-LS3-1 Make observations to construct an evidence-based account that young plants and animals are like, but not exactly like, their parents.** [Clarification Statement: Examples of patterns could include features plants or animals share. Examples of observations could include leaves from the same kind of plant are the same shape but can differ in size; and, a particular breed of dog looks like its parents but is not exactly the same.] [Assessment Boundary: Assessment does not include inheritance or animals that undergo metamorphosis or hybrids.]	*Ecosystems: Interactions, Energy, and Dynamics* **2-LS2-1 Plan and conduct an investigation to determine if plants need sunlight and water to grow.** [Assessment Boundary: Assessment is limited to testing one variable at a time.] **2-LS2-1 Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.*** *Biological Evolution: Unity and Diversity* **2LS4-1 Make observations of plants and animals to compare the diversity of life in different habitats.** [Clarification Statement: Emphasis is on the diversity of living things in each of a variety of different habitats.] [Assessment Boundary: Assessment does not include specific animal and plant names in specific habitats.]

Earth and Space Science

Grade K students:	Grade 1 students:	Grade 2 students:
***Earth and Space Science:** ESS1 Earth's Place in the Universe; ESS2 Earth's Systems; ESS3 Earth and Human Activity* *Students who demonstrate understanding can:*		

Grade K students:	Grade 1 students:	Grade 2 students:
Earth's Systems **K-ESS2-1 Use and share observations of local weather conditions to describe patterns over time.** [Clarification Statement: Examples of qualitative observations could include descriptions of the weather (such as sunny, cloudy, rainy, and warm); examples of quantitative observations could include numbers of sunny, windy, and rainy days in a month. Examples of patterns could include that it is usually cooler in the morning than in the afternoon and the number of sunny days versus cloudy days in different months.] [Assessment Boundary: Assessment of quantitative observations limited to whole numbers and relative measures such as warmer/cooler.] **K-ESS2-2 Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs.** [Clarification Statement: Examples of plants and animals changing their environment could include a squirrel digs in the ground to hide its food and tree roots can break concrete.] *Earth and Human Activity* **K-ESS3-1 Use a model to represent the relationship between the needs of different plants or animals (including humans) and the places they live.** [Clarification Statement: Examples of relationships could include that deer eat buds and leaves, therefore, they usually live in forested areas; and, grasses need sunlight so they often grow in meadows. Plants, animals, and their surroundings make up a system.] **K-ESS3-2 Ask questions to obtain information about the purpose of weather forecasting to prepare for, and respond to, severe weather.*** [Clarification Statement: Emphasis is on local forms of severe weather.] **K-ESS3-3 Communicate solutions that will reduce the impact of humans on the land, water, air, and/or other living things in the local environment.*** [Clarification Statement: Examples of human impact on the land could include cutting trees to produce paper and using resources to produce bottles. Examples of solutions could include reusing paper and recycling cans and bottles.]	*Earth's Place in the Universe* **1-ESS1-1 Use observations of the sun, moon, and stars to describe patterns that can be predicted.** [Clarification Statement: Examples of patterns could include that the sun and moon appear to rise in one part of the sky, move across the sky, and set; and stars other than our sun are visible at night but not during the day.] [Assessment Boundary: Assessment of star patterns is limited to stars being seen at night and not during the day.] **1-ESS1-2 Make observations at different times of year to relate the amount of daylight to the time of year.** [Clarification Statement: Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall.] [Assessment Boundary: Assessment is limited to relative amounts of daylight, not quantifying the hours or time of daylight.]	*Earth's Place in the Universe* **2-ESS1-1 Make observations from media to construct an evidence-based account that Earth events can occur quickly or slowly.** [Clarification Statement: Examples of events and timescales could include volcanic explosions and earthquakes, which happen quickly and erosion of rocks, which occurs slowly.] [Assessment Boundary: Assessment does not include quantitative measurements of timescales.] *Earth's Systems* **2-ESS2-1 Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.*** [Clarification Statement: Examples of solutions could include different designs of dikes and windbreaks to hold back wind and water, and different designs for using shrubs, grass, and trees to hold back the land.] **2-ESS2-2 Develop a model to represent the shapes and kinds of land and bodies of water in an area.** [Assessment Boundary: Assessment does not include quantitative scaling in models.] **2-ESS2-3 Obtain information to identify where water is found on Earth and that it can be solid or liquid.**

Engineering Design

Grade K – 2 students:
Engineering Design: *Students who demonstrate understanding can:*

Grade K – 2 students:

Engineering Design:

Students who demonstrate understanding can:

K-2- ETS1-1 Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

K-2- ETS1-1 Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

K-2- ETS1-1 Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

Third Grade

The performance expectations in third grade help students formulate answers to questions such as: "What is typical weather in different parts of the world and during different times of the year? How can the impact of weather-related hazards be reduced? How do organisms vary in their traits? How are plants, animals, and environments of the past similar or different from current plants, animals, and environments? What happens to organisms when their environment changes? How do equal and unequal forces on an object affect the object? How can magnets be used?" Third grade performance expectations include PS2, LS1, LS2, LS3, LS4, ESS2, and ESS3 Disciplinary Core Ideas from the NRC Framework. Students are able to organize and use data to describe typical weather conditions expected during a particular season. By applying their understanding of weather-related hazards, students are able to make a claim about the merit of a design solution that reduces the impacts of such hazards. Students are expected to develop an understanding of the similarities and differences of organisms' life cycles. An understanding that organisms have different inherited traits, and that the environment can also affect the traits that an organism develops, is acquired by students at this level. In addition, students are able to construct an explanation using evidence for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing. Students are expected to develop an understanding of types of organisms that lived long ago and also about the nature of their environments. Third graders are expected to develop an understanding of the idea that when the environment changes some organisms survive and reproduce, some move to new locations, some move into the transformed environment, and some die. Students are able to determine the effects of balanced and unbalanced forces on the motion of an object and the cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other. They are then able to apply their understanding of magnetic interactions to define a simple design problem that can be solved with magnets. The crosscutting concepts of patterns; cause and effect; scale, proportion, and quantity; systems and system models; interdependence of science, engineering, and technology; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. In the third grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in asking questions and defining problems; developing and using models, planning and carrying out investigations, analyzing and interpreting data, constructing explanations and designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

Fourth Grade

The performance expectations in fourth grade help students formulate answers to questions such as: "What are waves and what are some things they can do? How can water, ice, wind and vegetation change the land? What patterns of Earth's features can be determined with the use of maps? How do internal and external structures support the survival, growth, behavior, and reproduction of plants and animals? What is energy and how is it related to motion? How is energy transferred? How can energy be used to solve a problem?" Fourth grade performance expectations include PS3, PS4, LS1, ESS1, ESS2, ESS3, and ETS1 Disciplinary Core Ideas from the NRC Framework. Students are able to use a model of waves to describe patterns of waves in terms of amplitude and wavelength, and that waves can cause objects to move. Students are expected to develop understanding of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation. They apply their knowledge of natural Earth processes to generate and compare multiple solutions to reduce the impacts of such processes on humans. In order to describe patterns of Earth's features, students analyze and interpret data from maps. Fourth graders are expected to develop an understanding that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction. By developing a model, they describe that an object can be seen when light reflected from its surface enters the eye. Students are able to use evidence to construct an explanation of the relationship between the speed of an object and the energy of that object. Students are expected to develop an understanding that energy can be transferred from place to place by sound, light, heat, and electric currents or from object to object through collisions. They apply their understanding of energy to design, test, and refine a device that converts energy from one form to another. The crosscutting concepts of patterns; cause and effect; energy and matter; systems and system models; interdependence of science, engineering, and technology; and influence of engineering, technology, and science on society and the natural world are called out as organizing concepts for these disciplinary core ideas. In the fourth grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in asking questions, developing and using models, planning and carrying out investigations, analyzing and interpreting data, constructing explanations and designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information. Students are expected to use these practices to demonstrate understanding of the core ideas.

Fifth Grade

The performance expectations in fifth grade help students formulate answers to questions such as: "When matter changes, does its weight change? How much water can be found in different places on Earth? Can new substances be created by combining other substances? How does matter cycle through ecosystems? Where does the energy in food come from and what is it used for? How do lengths and directions of shadows or relative lengths of day and night change from day to day, and how does the appearance of some stars change in different seasons?" Fifth grade performance expectations include PS1, PS2, PS3, LS1, LS2, ESS1, ESS2, and ESS3 Disciplinary Core Ideas from the NRC Framework. Students are able to describe that matter is made of particles too small to be seen through the development of a model. Students develop an understanding of the idea that regardless of the type of change that matter undergoes, the total weight of matter is conserved. Students determine whether the mixing of two or more substances results in new substances. Through the development of a model using an example, students are able to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact. They describe and graph data to provide evidence about the distribution of water on Earth. Students develop an understanding of the idea that plants get the materials they need for growth chiefly from air and water. Using models, students can describe the movement of matter among plants, animals, decomposers, and the environment and that energy in animals' food was once energy from the sun. Students are expected to develop an understanding of patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky. The crosscutting concepts of patterns; cause and effect; scale, proportion, and quantity; energy and matter; and systems and systems models are called out as organizing concepts for these disciplinary core ideas. In the fifth grade performance expectations, students are expected to demonstrate grade-appropriate proficiency in developing and using models, planning and carrying out investigations, analyzing and interpreting data, using mathematics and computational thinking, engaging in argument from evidence, and obtaining, evaluating, and communicating information; and to use these practices to demonstrate understanding of the core ideas.

Physical Science

Grade 3 students:	Grade 4 students:	Grade 5 students:
Physical Science: *PS1 Matter and Its Interactions; PS2 Motion and Stability: Forces and Interactions; PS3 Energy; PS4 Wave Properties*		
Students who demonstrate understanding can:		
Motion and Stability: Forces and Interactions **3-PS2-1 Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.** [Clarification Statement: Examples could include an unbalanced force on one side of a ball can make it start moving; and, balanced forces pushing on a box from both sides will not produce any motion at all.] [Assessment Boundary: Assessment is limited to one variable at a time: number, size, or direction of forces. Assessment does not include quantitative force size, only qualitative and relative. Assessment is limited to gravity being addressed as a force that pulls objects down.] **3-PS2-2 Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.** [Clarification Statement: Examples of motion with a predictable pattern could include a child swinging in a swing, a ball rolling back and forth in a bowl, and two children on a see-saw.] [Assessment Boundary: Assessment does not include technical terms such as period and frequency.] **3-PS2-3 Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.** [Clarification Statement: Examples of an electric force could include the force on hair from an electrically charged balloon and the electrical forces between a charged rod and pieces of paper; examples of a magnetic force could include the force between two permanent magnets, the force between an electromagnet and steel paperclips, and the force exerted by one magnet versus the force exerted	*Energy* **4-PS3-1 Use evidence to construct an explanation relating the speed of an object to the energy of that object.** [Assessment Boundary: Assessment does not include quantitative measures of changes in the speed of an object or on any precise or quantitative definition of energy.] **4-PS3-2 Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.** [Assessment Boundary: Assessment does not include quantitative measurements of energy.] **4-PS3-3 Ask questions and predict outcomes about the changes in energy that occur when objects collide.** [Clarification Statement: Emphasis is on the change in the energy due to the change in speed, not on the forces, as objects interact.] [Assessment Boundary: Assessment does not include quantitative measurements of energy.] **4-PS3-4 Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.*** [Clarification Statement: Examples of devices could include electric circuits that convert electrical energy into motion energy of a vehicle, light, or sound; and, a passive solar heater that converts light into heat. Examples of constraints could include the materials, cost, or time to design the device.] [Assessment Boundary: Devices should be limited to those that convert motion energy to electric energy or use stored energy to cause motion or produce light or sound.]	*Matter and Its Interactions* **5-PS1-1 Develop a model to describe that matter is made of particles too small to be seen.** [Clarification Statement: Examples of evidence could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.] [Assessment Boundary: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.] **5-PS1-2 Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved.** [Clarification Statement: Examples of reactions or changes could include phase changes, dissolving, and mixing that forms new substances.] [Assessment Boundary: Assessment does not include distinguishing mass and weight.] **5-PS1-3 Make observations and measurements to identify materials based on their properties.** [Clarification Statement: Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.] [Assessment Boundary: Assessment does not include density or distinguishing mass and weight.] **5-PS1-4 Conduct an investigation to determine whether the mixing of two or more substances results in new substances.**

Grade 3 students:	Grade 4 students:	Grade 5 students:
by two magnets. Examples of cause and effect relationships could include how the distance between objects affects strength of the force and how the orientation of magnets affects the direction of the magnetic force.] [Assessment Boundary: Assessment is limited to forces produced by objects that can be manipulated by students, and electrical interactions are limited to static electricity.] **3-PS2-4 Define a simple design problem that can be solved by applying scientific ideas about magnets.*** [Clarification Statement: Examples of problems could include constructing a latch to keep a door shut and creating a device to keep two moving objects from touching each other.]	*PS4 Wave Properties* **4-PS4-1 Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.** [Clarification Statement: Examples of models could include diagrams, analogies, and physical models using wire to illustrate wavelength and amplitude of waves.] [Assessment Boundary: Assessment does not include interference effects, electromagnetic waves, non-periodic waves, or quantitative models of amplitude and wavelength.] **4-PS4-2 Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.** [Assessment Boundary: Assessment does not include knowledge of specific colors reflected and seen, the cellular mechanisms of vision, or how the retina works.] **4-PS4-3 Generate and compare multiple solutions that use patterns to transfer information.*** [Clarification Statement: Examples of solutions could include drums sending coded information through sound waves, using a grid of 1's and 0's representing black and white to send information about a picture, and using Morse code to send text.]	*Motion and Stability: Forces and Interactions* **5-PS2-1 Support an argument that the gravitational force exerted by Earth on objects is directed down.** [Clarification Statement: "Down" is a local description of the direction that points toward the center of the spherical Earth.] [Assessment Boundary: Assessment does not include mathematical representation of gravitational force.] *Energy* **5-PS3-1 Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.** [Clarification Statement: Examples of models could include diagrams, and flow charts.]

Life Science

Grade 3 students:	Grade 4 students:	Grade 5 students:
Life Science: *LS1From Molecules to Organisms: Structures and Processes; LS2 Ecosystems: Interactions, Energy, and Dynamics; LS3 Heredity: Inheritance and Variation of Traits; LS4 Biological Evolution: Unity and Diversity* *Students who demonstrate understanding can:*		
From Molecules to Organisms: Structures and Processes; **3-LS1-1. Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.** [Clarification Statement: Changes organisms go through during their life form a pattern.] [Assessment Boundary: Assessment of plant life cycles is limited to those of flowering plants. Assessment does not include details of human reproduction.] *Ecosystems: Interactions, Energy, and Dynamics* **3-LS2-1. Construct an argument that some animals form groups that help members survive.**	*From Molecules to Organisms: Structures and Processes;* **4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.** [Clarification Statement: Examples of structures could include thorns, stems, roots, colored petals, heart, stomach, lung, brain, and skin.] [Assessment Boundary: Assessment is limited to macroscopic structures within plant and animal systems.] **4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.**	*From Molecules to Organisms: Structures and Processes* **5-LS1-1. Support an argument that plants get the materials they need for growth chiefly from air and water.** [Clarification Statement: Emphasis is on the idea that plant matter comes mostly from air and water, not from the soil.] *Ecosystems: Interactions, Energy, and Dynamics* **5-LS2-1. Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.** [Clarification Statement: Emphasis is on the idea that matter that is not food (air, water, decomposed materials in soil) is changed by plants into matter that is food.

Grade 3 students:	Grade 4 students:	Grade 5 students:
Heredity: Inheritance and Variation of Traits **3-LS3-1. Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.** [Clarification Statement: Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans.] [Assessment Boundary: Assessment does not include genetic mechanisms of inheritance and prediction of traits. Assessment is limited to non-human examples.] **3-LS3-2. Use evidence to support the explanation that traits can be influenced by the environment.** [Clarification Statement: Examples of the environment affecting a trait could include normally tall plants grown with insufficient water are stunted; and, a pet dog that is given too much food and little exercise may become overweight.] *Biological Evolution: Unity and Diversity* **3-LS4-1. Analyze and interpret data from fossils to provide evidence of the organisms and the environments in which they lived long ago.** [Clarification Statement: Examples of data could include type, size, and distributions of fossil organisms. Examples of fossils and environments could include marine fossils found on dry land, tropical plant fossils found in Arctic areas, and fossils of extinct organisms.] [Assessment Boundary: Assessment does not include identification of specific fossils or present plants and animals. Assessment is limited to major fossil types and relative ages.] **3-LS4-2. Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding mates, and reproducing.** [Clarification Statement: Examples of cause and effect relationships could be plants that have larger thorns than other plants may be less likely to be eaten by predators; and, animals that have better camouflage coloration than other animals may be more likely to survive and therefore more likely to leave offspring.] **3-LS4-3. Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.** [Clarification Statement: Examples of evidence could include needs and characteristics of the organisms and habitats involved. The organisms and their habitat make up a system in which the parts depend on each other.] **3-LS4-4. Make a claim about the merit of a**	[Clarification Statement: Emphasis is on systems of information transfer.] [Assessment Boundary: Assessment does not include the mechanisms by which the brain stores and recalls information or the mechanisms of how sensory receptors function.]	Examples of systems could include organisms, ecosystems, and the Earth.] [Assessment Boundary: Assessment does not include molecular explanations.]

Grade 3 students:	Grade 4 students:	Grade 5 students:
solution to a problem caused when the environment changes and the types of plants and animals that live there may change.* [Clarification Statement: Examples of environmental changes could include changes in land characteristics, water distribution, temperature, food, and other organisms.] [Assessment Boundary: Assessment is limited to a single environmental change. Assessment does not include the greenhouse effect or climate change.]		

Earth and Space Science

Grade 3 students:	Grade 4 students:	Grade 5 students:
***Earth and Space Science:** ESS1 Earth's Place in the Universe; ESS2 Earth's Systems; ESS3 Earth and Human Activity*		
Students who demonstrate understanding can:		
Earth's Systems **3-ESS2-1. Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.** [Clarification Statement: Examples of data at this grade level could include average temperature, precipitation, and wind direction.] [Assessment Boundary: Assessment of graphical displays is limited to pictographs and bar graphs. Assessment does not include climate change.] **Obtain and combine information to describe climates in different regions of the world.** *Earth and Human Activity* **3-ESS3-1. Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.*** [Clarification Statement: Examples of design solutions to weather-related hazards could include barriers to prevent flooding, wind resistant roofs, and lighting rods.]	*Earth's Place in the Universe* **4-ESS1-1. Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in a landscape over time.** [Clarification Statement: Examples of evidence from patterns could include rock layers with shell fossils above rock layers with plant fossils and no shells, indicating a change from water to land over time; and, a canyon with different rock layers in the walls and a river in the bottom, indicating that over time a river cut through the rock.] [Assessment Boundary: Assessment does not include specific knowledge of the mechanism of rock formation or memorization of specific rock formations and layers. Assessment is limited to relative time.] *Earth's Systems* **4-ESS1-1. Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.** [Clarification Statement: Examples of variables to test could include angle of slope in the downhill movement of water, amount of vegetation, speed of wind, relative rate of deposition, cycles of freezing and thawing of water, cycles of heating and cooling, and volume of water flow.] [Assessment Boundary: Assessment is limited to a single form of weathering or erosion.]	*Earth's Place in the Universe* *Earth's Place in the Universe* **5-ESS1-1. Support an argument that the apparent brightness of the sun and stars is due to their relative distances from Earth.** [Assessment Boundary: Assessment is limited to relative distances, not sizes, of stars. Assessment does not include other factors that affect apparent brightness (such as stellar masses, age, stage).] **5-ESS1-2. Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.** [Clarification Statement: Examples of patterns could include the position and motion of Earth with respect to the sun and selected stars that are visible only in particular months.] [Assessment Boundary: Assessment does not include causes of seasons.] *Earth's Systems* **5-ESS1-1. Develop a model using an example to describe ways the geosphere, biosphere, hydrosphere, and/or atmosphere interact.** [Clarification Statement: Examples could include the influence of the ocean on ecosystems, landform shape, and climate; the influence of the atmosphere

Grade 3 students:	Grade 4 students:	Grade 5 students:
	4-ESS1-2. Analyze and interpret data from maps to describe patterns of Earth's features. [Clarification Statement: Maps can include topographic maps of Earth's land and ocean floor, as well as maps of the locations of mountains, continental boundaries, volcanoes, and earthquakes.] *Earth and Human Activity* **4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.** [Clarification Statement: Examples of renewable energy resources could include wind energy, water behind dams, and sunlight; non-renewable energy resources are fossil fuels and fissile materials. Examples of environmental effects could include loss of habitat due to dams, loss of habitat due to surface mining, and air pollution from burning of fossil fuels.] **4-ESS3-2. Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.*** [Clarification Statement: Examples of solutions could include designing an earthquake resistant building and improving monitoring of volcanic activity.] [Assessment Boundary: Assessment is limited to earthquakes, floods, tsunamis, and volcanic eruptions.]	on landforms and ecosystems through weather and climate; and the influence of mountain ranges on winds and clouds in the atmosphere. The geosphere, hydrosphere, atmosphere, and biosphere are each a system.] [Assessment Boundary: Assessment is limited to the interactions of two systems at a time.] **5-ESS1-1. Describe and graph the amounts and percentages of water and fresh water in various reservoirs to provide evidence about the distribution of water on Earth.** [Assessment Boundary: Assessment is limited to oceans, lakes, rivers, glaciers, ground water, and polar ice caps, and does not include the atmosphere.] *Earth and Human Activity* **5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.**

Engineering Design

Grade 3 – 5 students:
Engineering Design: *Students who demonstrate understanding can:*
3-5-ETS-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. **3-5-ETS-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.** **3-5-ETS-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.**

Middle School Physical Science

Students in middle school continue to develop understanding of four core ideas in the physical sciences. The middle school performance expectations in the Physical Sciences build on the K – 5 ideas and capabilities to allow learners to explain phenomena central to the physical sciences but also to the life sciences and earth and space science. The performance expectations in physical science blend the core ideas with scientific and engineering practices and crosscutting concepts to support students in developing useable knowledge to explain real world phenomena in the physical, biological, and earth and space sciences. In the physical sciences, performance expectations at the middle school level focus on students developing understanding of several scientific practices. These include developing and using models, planning and conducting investigations, analyzing and interpreting data, using mathematical and computational thinking, and constructing explanations; and to use these practices to demonstrate understanding of the core ideas. Students are also expected to demonstrate understanding of several of engineering practices including design and evaluation.

The performance expectations in **PS1: Matter and its Interactions** help students to formulate an answer to the question, "How do atomic and molecular interactions explain the properties of matter that we see and feel?" by building understanding of what occurs at the atomic and molecular scale. In middle school, the PS1 Disciplinary Core Idea from the NRC Framework is broken down into two sub-ideas: the structure and properties of matter, and chemical reactions. By the end of middle school, students will be able to apply understanding that pure substances have characteristic physical and chemical properties and are made from a single type of atom or molecule. They will be able to provide molecular level accounts to explain states of matters and changes between states, that chemical reactions involve regrouping of atoms to form new substances, and that atoms rearrange during chemical reactions. Students are also able to apply an understanding of the design and the process of optimization in engineering to chemical reaction systems. The crosscutting concepts of patterns; cause and effect; scale, proportion and quantity; energy and matter; structure and function; interdependence of science, engineering, and technology; and influence of science, engineering and technology on society and the natural world are called out as organizing concepts for these disciplinary core ideas. In the PS1 performance expectations, students are expected to demonstrate proficiency in developing and using models, analyzing and interpreting data, designing solutions, and obtaining, evaluating, and communicating information. Students use these scientific and engineering practices to demonstrate understanding of the disciplinary core ideas.

The performance expectations in **PS2: Motion and Stability: Forces and Interactions** focuses on helping students understand ideas related to why some objects will keep moving, why objects fall to the ground and why some materials are attracted to each other while others are not. Students answer the question, "How can one describe physical interactions between objects and within systems of objects?" At the middle school level, the PS2 Disciplinary Core Idea from the NRC Framework is broken down into two sub-ideas: Forces and Motion and Types of interactions. By the end of middle school, students will be able to apply Newton's Third Law of Motion to relate forces to explain the motion of objects. Students also apply ideas about gravitational, electrical, and magnetic forces to explain a variety of phenomena including beginning ideas about why some materials attract each other while others repel. In particular, students will develop understanding that gravitational interactions are always attractive but that electrical and magnetic forces can be both attractive and negative. Students also develop ideas that objects can exert forces on each other even though the objects are not in contact, through fields. Students are also able to apply an engineering practice and concept to solve a problem caused when objects collide. The crosscutting concepts of cause and effect; system and system models; stability and change; and the influence of science, engineering, and technology on society and the natural world serve as organizing concepts for these disciplinary core ideas. In the PS2 performance expectations, students are expected to demonstrate proficiency in asking questions, planning and carrying out investigations, and designing solutions, and engaging in argument; and to use these practices to demonstrate understanding of the core ideas.

The performance expectations in **PS3: Energy** help students formulate an answer to the question, "How can energy be transferred from one object or system to another?" At the middle school level, the PS3 Disciplinary Core Idea from the NRC Framework is broken down into four sub-core ideas: Definitions of Energy, Conservation of Energy and Energy Transfer, the Relationship between Energy and Forces, and Energy in Chemical Process and Everyday Life. Students develop their understanding of important qualitative ideas about energy including that the interactions of objects can be explained and predicted using the concept of transfer of energy from one object or system of objects to another, and the total change of energy in any system is always equal to the total energy transferred into or out of the system. Students understand that objects that are moving have kinetic energy and that objects may also contain stored (potential) energy, depending on their relative positions in a field. Students will also come to know the difference between energy and temperature, and begin to develop an understanding of the relationship between force and energy. Students are also able to apply an understanding of design to the process of energy transfer. The crosscutting concepts of scale, proportion, and quantity; systems and system models; and energy are called out as organizing concepts for these disciplinary core ideas. The performance expectations in PS3 expect students to demonstrate proficiency in developing and using models, planning investigations, analyzing and interpreting data, and designing solutions, and engaging in argument from evidence; and to use these practices to demonstrate understanding of the core ideas in PS3.

The performance expectations in **PS4: Waves and Their Applications in Technologies for Information Transfer** help students formulate an answer to the question, "What are the characteristic properties of waves and how can they be used?" At the middle school level, the PS4 Disciplinary Core Idea from the NRC Framework is broken down into Wave Properties, Electromagnetic Radiation, and Information Technologies and Instrumentation. Students are able to describe and predict characteristic properties and behaviors of waves when the waves interact with matter. Students can apply an understanding of waves as a means to send digital information. The crosscutting concepts of patterns and structure and function are used as organizing concepts for these disciplinary core ideas. The performance expectations in PS4 focus on students demonstrating proficiency in developing and using models, using mathematical thinking, and obtaining, evaluating and communicating information; and to use these practices to demonstrate understanding of the core ideas.

Middle School Life Science

Students in middle school develop understanding of key concepts to help them make sense of life science. The ideas build upon students' science understanding from earlier grades and from the disciplinary core ideas, science and engineering practices, and crosscutting concepts of other experiences with physical and earth sciences. There are four life science disciplinary core ideas in middle school: 1) From Molecules to Organisms: Structures and Processes, 2) Ecosystems: Interactions, Energy, and Dynamics, 3) Heredity: Inheritance and Variation of Traits, 4) Biological Evolution: Unity and Diversity. The performance expectations in middle school blend the core ideas with scientific and engineering practices and crosscutting concepts to support students in developing useable knowledge across the science disciplines. While the performance expectations in middle school life science couple particular practices with specific disciplinary core ideas, instructional decisions should include use of many science and engineering practices integrated in the performance expectations.

The performance expectations in **LS1: From Molecules to Organisms: Structures and Processes** help students formulate an answer to the question, "How can one explain the ways cells contribute to the function of living organisms." The LS1 Disciplinary Core Idea from the NRC Framework is organized into four sub-ideas: Structure and Function, Growth and Development of Organisms, Organization for Matter and Energy Flow in Organisms, and Information Processing. Students can gather information and use this information to support explanations of the structure and function relationship of cells. They can communicate understanding of cell theory. They have a basic understanding of the role of cells in body systems and how those systems work to support the life functions of the organism. The understanding of cells provides a context for the plant process of photosynthesis and the movement of matter and energy needed for the cell. Students can construct an explanation for how environmental and genetic factors affect growth of organisms. They can connect this to the role of animal behaviors in reproduction of animals as well as the dependence of some plants on animal behaviors for their reproduction. Crosscutting concepts of cause and effect, structure and function, and matter and energy are called out as organizing concepts for the core ideas about processes of living organisms.

The performance expectations in **LS2: Interactions, Energy, and Dynamics Relationships in Ecosystems** help students formulate an answer to the question, "How does a system of living and non-living things operate to meet the needs of the organisms in an ecosystem?" The LS2 Disciplinary Core Idea is divided into three sub-ideas: Interdependent Relationships in Ecosystems; Cycles of Matter and Energy Transfer in Ecosystems; and Ecosystem Dynamics, Functioning, and Resilience. Students can analyze and interpret data, develop models, and construct arguments and demonstrate a deeper understanding of resources and the cycling of matter and the flow of energy in ecosystems. They can also study patterns of the interactions among organisms within an ecosystem. They consider biotic and abiotic factors in an ecosystem and the effects these factors have on population. They evaluate competing design solutions for maintaining biodiversity and ecosystem services.

The performance expectations in **LS3: Heredity: Inheritance and Variation of Traits** help students formulate an answer to the question, "How do living organisms pass traits from one generation to the next?" The LS3 Disciplinary Core Idea from the NRC Framework includes two sub-ideas: Inheritance of Traits, and Variation of Traits. Students can use models to describe ways gene mutations and sexual reproduction contribute to genetic variation. Crosscutting concepts of cause and effect and structure and function provide students with a deeper understanding of how gene structure determines differences in the functioning of organisms.

The performance expectations in **LS4: Biological Evolution: Unity and Diversity** help students formulate an answer to the question, "How do organisms change over time in response to changes in the environment?" The LS4 Disciplinary Core Idea is divided into four sub-ideas: Evidence of Common Ancestry and Diversity, Natural Selection, Adaptation, and Biodiversity and Humans. Students can construct explanations based on evidence to support fundamental understandings of natural selection and evolution. They can use ideas of genetic variation in a population to make sense of organisms surviving and reproducing, hence passing on the traits of the species. They are able to use fossil records and anatomical similarities of the relationships among organisms and species to support their understanding. Crosscutting concepts of patterns and structure and function contribute to the evidence students can use to describe biological evolution.

Middle School Earth and Space Sciences

Students in middle school continue to develop their understanding of the three disciplinary core ideas in the Earth and Space Sciences. The middle school performance expectations in Earth Space Science build on the elementary school ideas and skills and allow middle school students to explain more in-depth phenomena central not only to the earth and space sciences, but to life and physical sciences as well. These performance expectations blend the core ideas with scientific and engineering practices and crosscutting concepts to support students in developing useable knowledge to explain ideas across the science disciplines. While the performance expectations shown in middle school earth and space science couple particular practices with specific disciplinary core ideas, instructional decisions should include use of many practices that lead to the performance expectations.

The performance expectations in **ESS1: Earth's Place in the Universe**, help students formulate an answer to questions such as: "What is Earth's place in the Universe, What makes up our solar system and how can the motion of Earth explain seasons and eclipses, and How do people figure out that the Earth and life on Earth have changed through time?" The ESS1 Disciplinary Core Idea from the NRC Framework is broken down into three sub-ideas: the universe and its stars, Earth and the solar system and the history of planet Earth. Students examine the Earth's place in relation to the solar system, Milky Way galaxy, and universe. There is a strong emphasis on a systems approach, using models of the solar system to explain astronomical and other observations of the cyclic patterns of eclipses, tides, and seasons. There is also a strong connection to engineering through the instruments and technologies that have allowed us to explore the objects in our solar system and obtain the data that support the theories that explain the formation and evolution of the universe. Students examine geoscience data in order to understand the processes and events in Earth's history. The crosscutting concepts of patterns, scale, proportion, and quantity, and systems and systems modeling are called out as organizing concepts for these disciplinary core ideas. In the ESS1 performance expectations, students are expected to demonstrate proficiency in developing and using models, analyzing data, and constructing explanations and designing solutions; and to use these practices to demonstrate understanding of the core ideas.

The performance expectations in **ESS2: Earth's Systems**, help students formulate an answer to questions such as: "How do the materials in and on Earth's crust change over time, How does the movement of tectonic plates impact the surface of Earth, How does water influence weather, circulate in the oceans, and shape Earth's surface, What factors interact and influence weather, and How have living organisms changed the Earth and how have Earth's changing conditions impacted living organisms?" The ESS2 Disciplinary Core Idea from the NRC Framework is broken down into five sub-ideas: Earth materials and systems, plate tectonics and large-scale system interactions, the roles of water in Earth's surface processes, weather and climate, and biogeology. Students understand how Earth's geosystems operate by modeling the flow of energy and cycling of matter within and among different systems. Students investigate the controlling properties of important materials and construct explanations based on the analysis of real geoscience data. Of special importance in both topics are the ways that geoscience processes provide resources needed by society but also cause natural hazards that present risks to society; both involve technological challenges, for the identification and development of resources. Students develop understanding of the factors that control weather. A systems approach is also important here, examining the feedbacks between systems as energy from the sun is transferred between systems and circulates though the ocean and atmosphere. The crosscutting concepts of patterns, cause and effect, scale proportion and quantity, systems and system models, energy and matter, and stability and change are called out as organizing concepts for these disciplinary core ideas. In the ESS2 performance expectations, students are expected to demonstrate proficiency in developing and using models, planning and carrying out investigations, analyzing and interpreting data, and constructing explanations; and to use these practices to demonstrate understanding of the core ideas.

The performance expectations in **ESS3: Earth and Human Activity** help students formulate an answer to questions such as: "How is the availability of needed natural resources related to naturally occurring processes, How can natural hazards be predicted, How do human activities affect Earth systems, How do we know our global climate is changing?"The ESS3 Disciplinary Core Idea from the NRC Framework is broken down into four sub-ideas: natural resources, natural hazards, human impact on Earth systems, and global climate change. Students understand the ways that human activities impacts Earth's other systems. Students use many different practices to understand the significant and complex issues surrounding human uses of land, energy, mineral, and water resources and the resulting impacts of their development. The crosscutting concepts of patterns, cause and effect, and stability and change are called out as organizing concepts for these disciplinary core ideas. In the ESS3 performance expectations, students are expected to demonstrate proficiency in asking questions, developing and using models, analyzing and interpreting data, constructing explanations and designing solutions and engaging in argument; and to use these practices to demonstrate understanding of the core ideas.

High School Physical Sciences

Students in high school continue to develop their understanding of the four core ideas in the physical sciences. These ideas include the most fundamental concepts from chemistry and physics, but are intended to leave room for expanded study in upper-level high school courses. The high school performance expectations in Physical Science build on the middle school ideas and skills and allow high school students to explain more in-depth phenomena central not only to the physical sciences, but to life and earth and space sciences as well. These performance expectations blend the core ideas with scientific and engineering practices and crosscutting concepts to support students in developing useable knowledge to explain ideas across the science disciplines. In the physical science performance expectations at the high school level, there is a focus on several scientific practices. These include developing and using models, planning and conducting investigations, analyzing and interpreting data, using mathematical and computational thinking, and constructing explanations; and to use these practices to demonstrate understanding of the core ideas. Students are also expected to demonstrate understanding of several engineering practices including design and evaluation.

The performance expectations in **PS1: Matter and its interactions** help students formulate an answer to the question, "How can one explain the structure, properties, and interactions of matter?" The PS1 Disciplinary Core Idea from the NRC Framework is broken down into three sub- ideas: the structure and properties of matter, chemical reactions, and nuclear processes. Students are expected to develop understanding of the substructure of atoms and to provide more mechanistic explanations of the properties of substances. Chemical reactions, including rates of reactions and energy changes, can be understood by students at this level in terms of the collisions of molecules and the rearrangements of atoms. Students are able to use the periodic table as a tool to explain and predict the properties of elements. Using this expanded knowledge of chemical reactions, students are able to explain important biological and geophysical phenomena. Phenomena involving nuclei are also important to understand, as they explain the formation and abundance of the elements, radioactivity, the release of energy from the sun and other stars, and the generation of nuclear power. Students are also able to apply an understanding of the process of optimization in engineering design to chemical reaction systems. The crosscutting concepts of patterns, energy and matter, and stability and change are called out as organizing concepts for these disciplinary core ideas. In the PS1 performance expectations, students are expected to demonstrate proficiency in developing and using models, planning and conducting investigations, using mathematical thinking, and constructing explanations and designing solutions; and to use these practices to demonstrate understanding of the core ideas.

The Performance Expectations associated with **PS2: Motion and Stability: Forces and Interactions** support students' understanding of ideas related to why some objects will keep moving, why objects fall to the ground and why some materials are attracted to each other while others are not. Students should be able to answer the question, "How can one explain and predict interactions between objects and within systems of objects?" The disciplinary core idea expressed in the Framework for PS2 is broken down into the sub ideas of Forces and Motion and Types of Interactions. The performance expectations in PS2 focus on students building understanding of forces and interactions and Newton's Second Law. Students also develop understanding that the total momentum of a system of objects is conserved when there is no net force on the system. Students are able to use Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects. Students are able to apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a

macroscopic object during a collision. The crosscutting concepts of patterns, cause and effect, systems and system models, and structure and function are called out as organizing concepts for these disciplinary core ideas. In the PS2 performance expectations, students are expected to demonstrate proficiency in planning and conducting investigations, analyzing data and using math to support claims, applying scientific ideas to solve design problems, and communicating scientific and technical information; and to use these practices to demonstrate understanding of the core ideas.

The Performance Expectations associated with **PS3: Energy** help students formulate an answer to the question, "How is energy transferred and conserved?" The Core Idea expressed in the Framework for PS3 is broken down into four sub-core ideas: Definitions of Energy, Conservation of Energy and Energy Transfer, the Relationship between Energy and Forces, and Energy in Chemical Process and Everyday Life. Energy is understood as quantitative property of a system that depends on the motion and interactions of matter and radiation within that system, and the total change of energy in any system is always equal to the total energy transferred into or out of the system. Students develop an understanding that energy at both the macroscopic and the atomic scale can be accounted for as either motions of particles or energy stored in fields. Students also demonstrate their understanding of engineering principles when they design, build, and refine devices associated with the conversion of energy. The crosscutting concepts of cause and effect; systems and system models; energy and matter; and the influence of science, engineering, and technology on society and the natural world are further developed in the performance expectations associated with PS3. In these performance expectations, students are expected to demonstrate proficiency in developing and using models, planning and carry out investigations, using computational thinking and designing solutions; and to use these practices to demonstrate understanding of the core ideas.

The Performance Expectations associated with **PS4: Waves and Their Applications in Technologies for Information Transfer** are critical to understand how many new technologies work. As such, this core idea helps students answer the question, “How are waves used to transfer energy and send and store information?” The disciplinary core idea in PS4 is broken down into Wave Properties, Electromagnetic Radiation, and Information Technologies and Instrumentation. Students are able to apply understanding of how wave properties and the interactions of electromagnetic radiation with matter can transfer information across long distances, store information, and investigate nature on many scales. Models of electromagnetic radiation as either a wave of changing electric and magnetic fields or as particles are developed and used. Students understand that combining waves of different frequencies can make a wide variety of patterns and thereby encode and transmit information. Students also demonstrate their understanding of engineering ideas by presenting information about how technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy. The crosscutting concepts of cause and effect; systems and system models; stability and change; interdependence of science, engineering, and technology; and the influence of engineering, technology, and science on society and the natural world are highlighted as organizing concepts for these disciplinary core ideas. In the PS3 performance expectations, students are expected to demonstrate proficiency in asking questions, using mathematical thinking, engaging in argument from evidence and obtaining, evaluating and communicating information; and to use these practices to demonstrate understanding of the core ideas.

High School Life Sciences

Students in high school develop understanding of key concepts that will help them make sense of life science. The ideas are built upon students' science understanding of disciplinary core ideas, science and engineering practices, and crosscutting concepts from earlier grades. There are four life science disciplinary core ideas in high school: 1) From Molecules to Organisms: Structures and Processes, 2) Ecosystems: Interactions, Energy, and Dynamics, 3) Heredity: Inheritance and Variation of Traits, 4) Biological Evolution: Unity and Diversity. The performance expectations for high school life science blend core ideas with scientific and engineering practices and crosscutting concepts to support students in developing useable knowledge that can be applied across the science disciplines. While the performance expectations in high school life science couple particular practices with specific disciplinary core ideas, instructional decisions should include use of many practices underlying the performance expectations.

The performance expectations in **LS1: From Molecules to Organisms: Structures and Processes** help students formulate an answer to the question, “How do organisms live and grow?” The LS1 Disciplinary Core Idea from the NRC Framework is presented as three sub- ideas: Structure and Function, Growth and Development of Organisms, and Organization for Matter and Energy Flow in Organisms. In these performance expectations, students demonstrate that they can use investigations and gather evidence to support explanations of cell function and reproduction. They understand the role of proteins as essential to the work of the cell and living systems. Students can use models to explain photosynthesis, respiration, and the cycling of matter and flow of energy in living organisms. The cellular processes can be used as a model for understanding of the hierarchical organization of organism. Crosscutting concepts of matter and energy, structure and function, and systems and system models provide students with insights to the structures and processes of organisms.

The performance expectations in **LS2: Ecosystems: Interactions, Energy, and Dynamics** help students formulate an answer to the question, “How and why do organisms interact with their environment, and what are the effects of these interactions?” The LS2 Disciplinary Core Idea includes four sub-ideas: Interdependent Relationships in Ecosystems, Cycles of Matter and Energy Transfer in Ecosystems, Ecosystem Dynamics, Functioning, and Resilience, and Social Interactions and Group Behavior. High school students can use mathematical reasoning to demonstrate understanding of fundamental concepts of carrying capacity, factors affecting biodiversity and populations, and the cycling of matter and flow of energy among organisms in an ecosystem. These mathematical models provide support of students' conceptual understanding of systems and their ability to develop design solutions for reducing the impact of human activities on the environment and maintaining biodiversity. Crosscutting concepts of systems and system models play a central role in students' understanding of science and engineering practices and core ideas of ecosystems.

The performance expectations in **LS3: Heredity: Inheritance and Variation of Traits** help students formulate answers to the questions: "How are characteristics of one generation passed to the next? How can individuals of the same species and even siblings have different characteristics?" The LS3 Disciplinary Core Idea from the NRC Framework includes two sub- ideas: Inheritance of Traits, and Variation of Traits. Students are able to ask questions, make and defend a claim, and use concepts of probability to explain the genetic variation in a population. Students demonstrate understanding of why individuals of the same species vary in how they look, function, and behave. Students can explain the mechanisms of genetic inheritance and describe the environmental and genetic causes of gene mutation and the alteration of gene expression. Crosscutting concepts of patterns and cause and effect are called out as organizing concepts for these core ideas.

The performance expectations in **LS4: Biological Evolution: Unity and Diversity** help students formulate an answer to the question, "What evidence shows that different species are related? The LS4 Disciplinary Core Idea involves four sub-ideas: Evidence of Common Ancestry and Diversity, Natural Selection, Adaptation, and Biodiversity and Humans. Students can construct explanations for the processes of natural selection and evolution and communicate how multiple lines of evidence support these explanations. Students can evaluate evidence of the conditions that may result in new species and understand the role of genetic variation in natural selection. Additionally, students can apply concepts of probability to explain trends in populations as those trends relate to advantageous heritable traits in a specific environment. The crosscutting concepts of cause and effect and systems and system models play an important role in students' understanding of the evolution of life on Earth.

High School Earth and Space Sciences

Students in high school continue to develop their understanding of the three disciplinary core ideas in the Earth and Space Sciences. The high school performance expectations in Earth and Space Science build on the middle school ideas and skills and allow high school students to explain more in-depth phenomena central not only to the earth and space sciences, but to life and physical sciences as well. These performance expectations blend the core ideas with scientific and engineering practices and crosscutting concepts to support students in developing useable knowledge to explain ideas across the science disciplines. While the performance expectations shown in high school earth and space science couple particular practices with specific disciplinary core ideas, instructional decisions should include use of many practices that lead to the performance expectations.

The performance expectations in **ESS1: Earth's Place in the Universe**, help students formulate an answer to the question: "What is the universe, and what is Earth's place in it?" The ESS1 Disciplinary Core Idea from the NRC Framework is broken down into three sub-ideas: the universe and its stars, Earth and the solar system and the history of planet Earth. Students examine the processes governing the formation, evolution, and workings of the solar system and universe. Some concepts studied are fundamental to science, such as understanding how the matter of our world formed during the Big Bang and within the cores of stars. Others concepts are practical, such as understanding how short-term changes in the behavior of our sun directly affect humans. Engineering and technology play a large role here in obtaining and analyzing the data that support the theories of the formation of the solar system and universe. The crosscutting concepts of patterns, scale, proportion, and quantity, energy and matter, and stability and change are called out as organizing concepts for these disciplinary core ideas. In the ESS1 performance expectations, students are expected to demonstrate proficiency in developing and using models, using mathematical and computational thinking, constructing explanations and designing solutions, engaging in argument, and obtaining, evaluating and communicating information; and to use these practices to demonstrate understanding of the core ideas.

The performance expectations in **ESS2: Earth's Systems**, help students formulate an answer to the question: "How and why is Earth constantly changing?" The ESS2 Disciplinary Core Idea from the NRC Framework is broken down into five sub-ideas: Earth materials and systems, plate tectonics and large-scale system interactions, the roles of water in Earth's surface processes, weather and climate, and biogeology. For the purpose of the NGSS, biogeology has been addressed within the life science standards. Students develop models and explanations for the ways that feedbacks between different Earth systems control the appearance of Earth's surface. Central to this is the tension between internal systems, which are largely responsible for creating land at Earth's surface, and the sun-driven surface systems that tear down the land through weathering and erosion. Students begin to examine the ways that human activities cause feedbacks that create changes to other systems. Students understand the system interactions that control weather and climate, with a major emphasis on the mechanisms and implications of climate change. Students model the flow of energy between different components of the weather system and how this affects chemical cycles such as the carbon cycle. The crosscutting concepts of cause and effect, energy and matter, structure and function and stability and change are called out as organizing concepts for these disciplinary core ideas. In the ESS2 performance expectations, students are expected to demonstrate proficiency in developing and using models, planning and carrying out investigations, analyzing and interpreting data, and engaging in argument; and to use these practices to demonstrate understanding of the core ideas.

The performance expectations in **ESS3: Earth and Human Activity** help students formulate an answer to the question: "How do Earth's surface processes and human activities affect each other?" The ESS3 Disciplinary Core Idea from the NRC Framework is broken down into four sub-ideas: natural resources, natural hazards, human impact on Earth systems, and global climate change. Students understand the complex and significant interdependencies between humans and the rest of Earth's systems through the impacts of natural hazards, our dependencies on natural resources, and the significant environmental impacts of human activities. Engineering and technology figure prominently here, as students use mathematical thinking and the analysis of geoscience data to examine and construct solutions to the many challenges facing long-term human sustainability on Earth. The crosscutting concepts of cause and effect, systems and system models, and stability and change are called out as organizing concepts for these disciplinary core ideas. In the ESS3 performance expectations, students are expected to demonstrate proficiency in developing and using analyzing and interpreting data, mathematical and computational thinking, constructing explanations and designing solutions and engaging in argument; and to use these practices to demonstrate understanding of the core ideas.

Physical Science

Grade 6-8 students: **Grade 9-12 students:**

Physical Science: *PS1 Matter and Its Interactions; PS2 Motion and Stability: Forces and Interactions; PS3 Energy; PS4 Waves and Their Applications for Information Transfer*

Students who demonstrate understanding can:

Matter and Its Interactions

MS-PS1-1. Develop models to describe the atomic composition of simple molecules and extended structures. [Clarification Statement: Emphasis is on developing models of molecules that vary in complexity. Examples of simple molecules could include ammonia and methanol. Examples of extended structures could include sodium chloride or diamonds. Examples of molecular-level models could include drawings, 3D ball and stick structures, or computer representations showing different molecules with different types of atoms.] [Assessment Boundary: Assessment does not include valence electrons and bonding energy, discussing the ionic nature of subunits of complex structures, or a complete depiction of all individual atoms in a complex molecule or extended structure.]

MS-PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred. [Clarification Statement: Examples of reactions could include burning sugar or steel wool, fat reacting with sodium hydroxide, and mixing zinc with HCl.] [Assessment Boundary: Assessment is limited to analysis of the following properties: density, melting point, boiling point, solubility, flammability, and odor.]

MS-PS1-3. Gather and make sense of information to describe that synthetic materials come from natural resources and impact society. [Clarification Statement: Emphasis is on natural resources that undergo a chemical process to form the synthetic material. Examples of new materials could include new medicine, foods, and alternative fuels.] [Assessment Boundary: Assessment is limited to qualitative information.]

MS-PS1-4. Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed. [Clarification Statement: Emphasis is on qualitative molecular-level models of solids, liquids, and gases to show that adding or removing thermal energy increases or decreases kinetic energy of the particles until a change of state occurs. Examples of models could include drawings and diagrams. Examples of particles could include molecules or inert atoms. Examples of pure substances could include water, carbon dioxide, and helium.]

MS-PS1-5. Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. [Clarification Statement: Emphasis is on law of conservation of matter and on physical models or drawings, including digital forms, that represent atoms.] [Assessment Boundary: Assessment does not include the use of atomic masses, balancing symbolic equations, or intermolecular forces.]

MS-PS1-6. Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.* [Clarification Statement: Emphasis is on the design, controlling the transfer of energy to the environment, and modification of a device using factors such as type and concentration of a substance. Examples of designs could involve chemical reactions such as dissolving ammonium chloride or calcium chloride.] [Assessment Boundary: Assessment is limited to the criteria of amount, time, and temperature of substance in testing the device.]

Motion and Stability: Forces and Interactions

MS-PS2-1. Apply Newton's Third Law to design a solution to a problem

Matter and Its Interactions

HS-PS1-1. Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms. [Clarification Statement: Examples of properties that could be predicted from patterns could include reactivity of metals, types of bonds formed, numbers of bonds formed, and reactions with oxygen.] [Assessment Boundary: Assessment is limited to main group elements. Assessment does not include quantitative understanding of ionization energy beyond relative trends.]

HS-PS1-2. Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. [Clarification Statement: Examples of chemical reactions could include the reaction of sodium and chlorine, of carbon and oxygen, or of carbon and hydrogen.] [Assessment Boundary: Assessment is limited to chemical reactions involving main group elements and combustion reactions.]

HS-PS1-3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. [Clarification Statement: Emphasis is on understanding the strengths of forces between particles, not on naming specific intermolecular forces (such as dipole-dipole). Examples of particles could include ions, atoms, molecules, and networked materials (such as graphite). Examples of bulk properties of substances could include the melting point and boiling point, vapor pressure, and surface tension.] [Assessment Boundary: Assessment does not include Raoult's law calculations of vapor pressure.]

HS-PS1-4. Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy. [Clarification Statement: Emphasis is on the idea that a chemical reaction is a system that affects the energy change. Examples of models could include molecular-level drawings and diagrams of reactions, graphs showing the relative energies of reactants and products, and representations showing energy is conserved.] [Assessment Boundary: Assessment does not include calculating the total bond energy changes during a chemical reaction from the bond energies of reactants and products.]

HS-PS1-5. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs. [Clarification Statement: Emphasis is on student reasoning that focuses on the number and energy of collisions between molecules.] [Assessment Boundary: Assessment is limited to simple reactions in which there are only two reactants; evidence from temperature, concentration, and rate data; and qualitative relationships between rate and temperature.]

HS-PS1-6. Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.* [Clarification Statement: Emphasis is on the application of Le Chatlier's Principle and on refining designs of chemical reaction systems, including descriptions of the connection between changes made at the macroscopic level and what happens at the molecular level. Examples of designs could include different ways to increase product formation including adding reactants or removing products.] [Assessment Boundary: Assessment is limited to specifying the change in only one variable at a time. Assessment does not include calculating equilibrium constants and

involving the motion of two colliding objects.*
[Clarification Statement: Examples of practical problems could include the impact of collisions between two cars, between a car and stationary objects, and between a meteor and a space vehicle.] [Assessment Boundary: Assessment is limited to vertical or horizontal interactions in one dimension.]

MS-PS2-2. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object. [Clarification Statement: Emphasis is on balanced (Newton's First Law) and unbalanced forces in a system, qualitative comparisons of forces, mass and changes in motion (Newton's Second Law), frame of reference, and specification of units.] [Assessment Boundary: Assessment is limited to forces and changes in motion in one-dimension in an inertial reference frame and to change in one variable at a time. Assessment does not include the use of trigonometry.]

MS-PS2-3. Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
[Clarification Statement: Examples of devices that use electric and magnetic forces could include electromagnets, electric motors, or generators. Examples of data could include the effect of the number of turns of wire on the strength of an electromagnet, or the effect of increasing the number or strength of magnets on the speed of an electric motor.] [Assessment Boundary: Assessment about questions that require quantitative answers is limited to proportional reasoning and algebraic thinking.]

MS-PS2-4. Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects. [Clarification Statement: Examples of evidence for arguments could include data generated from simulations or digital tools; and charts displaying mass, strength of interaction, distance from the Sun, and orbital periods of objects within the solar system.] [Assessment Boundary: Assessment does not include Newton's Law of Gravitation or Kepler's Laws.]

MS-PS2-5. Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact. [Clarification Statement: Examples of this phenomenon could include the interactions of magnets, electrically-charged strips of tape, and electrically-charged pith balls. Examples of investigations could include first-hand experiences or simulations.] [Assessment Boundary: Assessment is limited to electric and magnetic fields, and limited to qualitative evidence for the existence of fields.]

Energy

MS-PS3-1. Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object. [Clarification Statement: Emphasis is on descriptive relationships between kinetic energy and mass separately from kinetic energy and speed. Examples could include riding a bicycle at different speeds, rolling different sizes of rocks downhill, and getting hit by a wiffle ball versus a tennis ball.]

MS-PS3-2. Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system. [Clarification Statement: Emphasis is on relative amounts of potential energy, not on calculations of potential energy. Examples of objects within systems interacting at varying distances could include: the Earth and either a roller coaster cart at varying positions on a hill or objects at varying heights on shelves, changing the direction/orientation of a magnet, and a balloon with static electrical charge being brought closer to a classmate's hair. Examples of models could include representations, diagrams, pictures, and written descriptions of systems.] [Assessment Boundary: Assessment is limited to two objects and electric, magnetic, and gravitational interactions.]

concentrations.]

HS-PS1-7. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. [Clarification Statement: Emphasis is on using mathematical ideas to communicate the proportional relationships between masses of atoms in the reactants and the products, and the translation of these relationships to the macroscopic scale using the mole as the conversion from the atomic to the macroscopic scale. Emphasis is on assessing students' use of mathematical thinking and not on memorization and rote application of problem-solving techniques.] [Assessment Boundary: Assessment does not include complex chemical reactions.]

HS-PS1-8. Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay. [Clarification Statement: Emphasis is on simple qualitative models, such as pictures or diagrams, and on the scale of energy released in nuclear processes relative to other kinds of transformations.] [Assessment Boundary: Assessment does not include quantitative calculation of energy released. Assessment is limited to alpha, beta, and gamma radioactive decays.]

Motion and Stability: Forces and Interactions

HS-PS2-1. Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration. [Clarification Statement: Examples of data could include tables or graphs of position or velocity as a function of time for objects subject to a net unbalanced force, such as a falling object, an object rolling down a ramp, or a moving object being pulled by a constant force.] [Assessment Boundary: Assessment is limited to one-dimensional motion and to macroscopic objects moving at non-relativistic speeds.]

HS-PS2-2. Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system. [Clarification Statement: Emphasis is on the quantitative conservation of momentum in interactions and the qualitative meaning of this principle.] [Assessment Boundary: Assessment is limited to systems of two macroscopic bodies moving in one dimension.]

HS-PS2-3. Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.*
[Clarification Statement: Examples of evaluation and refinement could include determining the success of the device at protecting an object from damage and modifying the design to improve it. Examples of a device could include a football helmet or a parachute.] [Assessment Boundary: Assessment is limited to qualitative evaluations and/or algebraic manipulations.]

HS-PS2-4. Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects. [Clarification Statement: Emphasis is on both quantitative and conceptual descriptions of gravitational and electric fields.] [Assessment Boundary: Assessment is limited to systems with two objects.]

HS-PS2-5. Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current. [Assessment Boundary: Assessment is limited to designing and conducting investigations with provided materials and tools.]

HS-PS2-6. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed

MS-PS3-3. Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.* [Clarification Statement: Examples of devices could include an insulated box, a solar cooker, and a Styrofoam cup.] [Assessment Boundary: Assessment does not include calculating the total amount of thermal energy transferred.]

MS-PS3-4. Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. [Clarification Statement: Examples of experiments could include comparing final water temperatures after different masses of ice melted in the same volume of water with the same initial temperature, the temperature change of samples of different materials with the same mass as they cool or heat in the environment, or the same material with different masses when a specific amount of energy is added.] [Assessment Boundary: Assessment does not include calculating the total amount of thermal energy transferred.]

MS-PS3-5. Construct, use, and present arguments to support the claim that when the motion energy of an object changes, energy is transferred to or from the object. [Clarification Statement: Examples of empirical evidence used in arguments could include an inventory or other representation of the energy before and after the transfer in the form of temperature changes or motion of object.] [Assessment Boundary: Assessment does not include calculations of energy.]

Waves and Their Applications for Information Transfer

MS-PS4-1. Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. [Clarification Statement: Emphasis is on describing waves with both qualitative and quantitative thinking.] [Assessment Boundary: Assessment does not include electromagnetic waves and is limited to standard repeating waves.]

MS-PS4-2. Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials. [Clarification Statement: Emphasis is on both light and mechanical waves. Examples of models could include drawings, simulations, and written descriptions.] [Assessment Boundary: Assessment is limited to qualitative applications pertaining to light and mechanical waves.]

MS-PS4-3. Integrate qualitative scientific and technical information to support the claim that digitized signals (sent as wave pulses) are a more reliable way to encode and transmit information. [Clarification Statement: Emphasis is on a basic understanding that waves can be used for communication purposes. Examples could include using fiber optic cable to transmit light pulses, radio wave pulses in wifi devices, and conversion of stored binary patterns to make sound or text on a computer screen.] [Assessment Boundary: Assessment does not include binary counting. Assessment does not include the specific mechanism of any given device.]

materials.* [Clarification Statement: Emphasis is on the attractive and repulsive forces that determine the functioning of the material. Examples could include why electrically conductive materials are often made of metal, flexible but durable materials are made up of long chained molecules, and pharmaceuticals are designed to interact with specific receptors.] [Assessment Boundary: Assessment is limited to provided molecular structures of specific designed materials.]

Energy

HS-PS2-1. Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known. [Clarification Statement: Emphasis is on explaining the meaning of mathematical expressions used in the model.] [Assessment Boundary: Assessment is limited to basic algebraic expressions or computations; to systems of two or three components; and to thermal energy, kinetic energy, and/or the energies in gravitational, magnetic, or electric fields.]

HS-PS2-2. Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as either motions of particles or energy stored in fields. [Clarification Statement: Examples of phenomena at the macroscopic scale could include the conversion of kinetic energy to thermal energy, the energy stored due to position of an object above the earth, and the energy stored between two electrically-charged plates. Examples of models could include diagrams, drawings, descriptions, and computer simulations.]

HS-PS2-3. Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.* [Clarification Statement: Emphasis is on both qualitative and quantitative evaluations of devices. Examples of devices could include Rube Goldberg devices, wind turbines, solar cells, solar ovens, and generators. Examples of constraints could include use of renewable energy forms and efficiency.] [Assessment Boundary: Assessment for quantitative evaluations is limited to total output for a given input. Assessment is limited to devices constructed with materials provided to students.]

HS-PS2-4. Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics). [Clarification Statement: Emphasis is on analyzing data from student investigations and using mathematical thinking to describe the energy changes both quantitatively and conceptually. Examples of investigations could include mixing liquids at different initial temperatures or adding objects at different temperatures to water.] [Assessment Boundary: Assessment is limited to investigations based on materials and tools provided to students.]

HS-PS2-5. Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction. [Clarification Statement: Examples of models could include drawings, diagrams, and texts, such as drawings of what happens when two charges of opposite polarity are near each other, including an explanation of how the change in energy of the objects is related to the change in energy of the field.] [Assessment Boundary: Assessment is limited to systems containing two objects.]

Waves and Their Applications for Information Transfer

HS-PS4-1. Use mathematical representations to support a claim regarding

	relationships among the frequency, wavelength, and speed of waves traveling in various media. [Clarification Statement: Examples of data could include electromagnetic radiation traveling in a vacuum and glass, sound waves traveling through air and water, and seismic waves traveling through the Earth.] [Assessment Boundary: Assessment is limited to algebraic relationships and describing those relationships qualitatively.] **HS-PS4-2. Evaluate questions about the advantages of using a digital transmission and storage of information.** [Clarification Statement: Examples of advantages could include that digital information is stable because it can be stored reliably in computer memory, transferred easily, and copied and shared rapidly. Disadvantages could include issues of easy deletion, security, and theft.] **HS-PS4-3. Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.** [Clarification Statement: Emphasis is on how the experimental evidence supports the claim and how a theory is generally modified in light of new evidence. Examples of a phenomenon could include resonance, interference, diffraction, and photoelectric effect.] [Assessment Boundary: Assessment does not include using quantum theory.] **HS-PS4-4. Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.** [Clarification Statement: Emphasis is on the idea that different frequencies of light have different energies, and the damage to living tissue from electromagnetic radiation depends on the energy of the radiation. Examples of published materials could include trade books, magazines, web resources, videos, and other passages that may reflect bias.] [Assessment Boundary: Assessment is limited to qualitative descriptions.] **HS-PS4-5. Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.*** [Clarification Statement: Examples could include solar cells capturing light and converting it to electricity; medical imaging; and communications technology.] [Assessment Boundary: Assesments are limited to qualitative information. Assessments do not include band theory.]

Life Science

Grade 6-8 students:	Grade 9-12 students:
***Life Science**: LS1From Molecules to Organisms: Structures and Processes; LS2 Ecosystems: Interactions, Energy, and Dynamics; LS3 Heredity: Inheritance and Variation of Traits; LS4 Biological Evolution: Unity and Diversity* *Students who demonstrate understanding can:*	
From Molecules to Organisms: Structures and Processes **MS-LS1-1. Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.** [Clarification Statement: Emphasis is on developing evidence that living things are made of cells, distinguishing between living and non-living cells, and understanding that living things may be made of one cell or many and varied cells.]	*From Molecules to Organisms: Structures and Processes* **HS-LS1-1. Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.** [Assessment Boundary: Assessment does not include identification of specific cell or tissue types, whole body systems, specific protein structures and functions, or the biochemistry of protein synthesis.]

Grade 6-8 students:	Grade 9-12 students:

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Students who demonstrate understanding can:

MS-LS1-2. Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function. [Clarification Statement: Emphasis is on the cell functioning as a whole system and the primary role of identified parts of the cell, specifically the nucleus, chloroplasts, mitochondria, cell membrane, and cell wall.] [Assessment Boundary: Assessment of organelle structure/function relationships is limited to the cell wall and cell membrane. Assessment of the function of the other organelles is limited to their relationship to the whole cell. Assessment does not include the biochemical function of cells or cell parts.]

MS-LS1-3. Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells. [Clarification Statement: Emphasis is on the conceptual understanding that cells form tissues and tissues form organs specialized for particular body functions. Examples could include the interaction of subsystems within a system and the normal functioning of those systems.] [Assessment Boundary: Assessment does not include the mechanism of one body system independent of others. Assessment is limited to the circulatory, excretory, digestive, respiratory, muscular, and nervous systems.]

MS-LS1-4. Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively. [Clarification Statement: Examples of behaviors that affect the probability of animal reproduction could include nest building to protect young from cold, herding of animals to protect young from predators, and vocalization of animals and colorful plumage to attract mates for breeding. Examples of animal behaviors that affect the probability of plant reproduction could include transferring pollen or seeds; and, creating conditions for seed germination and growth. Examples of plant structures could include bright flowers attracting butterflies that transfer pollen, flower nectar and odors that attract insects that transfer pollen, and hard shells on nuts that squirrels bury.]

MS-LS1-5. Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms. [Clarification Statement: Examples of local environmental conditions could include availability of food, light, space, and water. Examples of genetic factors could include large breed cattle and species of grass affecting growth of organisms. Examples of evidence could include drought decreasing plant growth, fertilizer increasing plant growth, different varieties of plant seeds growing at different rates in different conditions, and fish growing larger in large ponds than they do in small ponds.] [Assessment Boundary: Assessment does not include genetic mechanisms, gene regulation, or biochemical processes.]

MS-LS1-6. Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms. [Clarification Statement: Emphasis is on tracing movement of matter and flow of energy.] [Assessment Boundary: Assessment does not include the biochemical mechanisms of photosynthesis.]

MS-LS1-7. Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism. [Clarification Statement: Emphasis is on describing that molecules are broken apart and put back together and that in this process, energy is released.] [Assessment Boundary: Assessment does not include details of the chemical reactions for photosynthesis or respiration.]

HS-LS1-2. Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms. [Clarification Statement: Emphasis is on functions at the organism system level such as nutrient uptake, water delivery, and organism movement in response to neural stimuli. An example of an interacting system could be an artery depending on the proper function of elastic tissue and smooth muscle to regulate and deliver the proper amount of blood within the circulatory system.] [Assessment Boundary: Assessment does not include interactions and functions at the molecular or chemical reaction level.]

HS-LS1-3. Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis. [Clarification Statement: Examples of investigations could include heart rate response to exercise, stomate response to moisture and temperature, and root development in response to water levels.] [Assessment Boundary: Assessment does not include the cellular processes involved in the feedback mechanism.]

HS-LS1-4. Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms. [Assessment Boundary: Assessment does not include specific gene control mechanisms or rote memorization of the steps of mitosis.]

HS-LS1-5. Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy. [Clarification Statement: Emphasis is on illustrating inputs and outputs of matter and the transfer and transformation of energy in photosynthesis by plants and other photosynthesizing organisms. Examples of models could include diagrams, chemical equations, and conceptual models.] [Assessment Boundary: Assessment does not include specific biochemical steps.]

HS-LS1-6. Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules. [Clarification Statement: Emphasis is on using evidence from models and simulations to support explanations.] [Assessment Boundary: Assessment does not include the details of the specific chemical reactions or identification of macromolecules.]

HS-LS1-7. Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy. [Clarification Statement: Emphasis is on the conceptual understanding of the inputs and outputs of the process of cellular respiration.] [Assessment Boundary: Assessment should not include identification of the steps or specific processes involved in cellular respiration.]

Ecosystems: Interactions, Energy, and Dynamics

HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales. [Clarification Statement: Emphasis is on quantitative analysis and comparison of the relationships among interdependent factors including boundaries, resources, climate, and competition. Examples of mathematical comparisons could include graphs, charts, histograms, and population changes gathered from simulations or historical data sets.] [Assessment Boundary: Assessment does not include deriving mathematical equations to make

Grade 6-8 students:	Grade 9-12 students:

***Life Science**: LS1From Molecules to Organisms: Structures and Processes; LS2 Ecosystems: Interactions, Energy, and Dynamics; LS3 Heredity: Inheritance and Variation of Traits; LS4 Biological Evolution: Unity and Diversity*

Students who demonstrate understanding can:

MS-LS1-8. Gather and synthesize information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior or storage as memories. [Assessment Boundary: Assessment does not include mechanisms for the transmission of this information.]

Ecosystems: Interactions, Energy, and Dynamics

MS-LS2-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem. [Clarification Statement: Emphasis is on cause and effect relationships between resources and growth of individual organisms and the numbers of organisms in ecosystems during periods of abundant and scarce resources.]

MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems. [Clarification Statement: Emphasis is on predicting consistent patterns of interactions in different ecosystems in terms of the relationships among and between organisms and abiotic components of ecosystems. Examples of types of interactions could include competitive, predatory, and mutually beneficial.]

MS-LS2-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. [Clarification Statement: Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system.] [Assessment Boundary: Assessment does not include the use of chemical reactions to describe the processes.]

MS-LS2-4. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations. [Clarification Statement: Emphasis is on recognizing patterns in data and making warranted inferences about changes in populations, and on evaluating empirical evidence supporting arguments about changes to ecosystems.]

MS-LS2-5. Evaluate competing design solutions for maintaining biodiversity and ecosystem services.* [Clarification Statement: Examples of ecosystem services could include water purification, nutrient recycling, and prevention of soil erosion. Examples of design solution constraints could include scientific, economic, and social considerations.]

Heredity: Inheritance and Variation of Traits

MS-LS3-1. Develop and use a model to describe why structural changes to genes (mutations) located on chromosomes may affect proteins and may result in harmful, beneficial, or neutral effects to the structure and function of the organism. [Clarification Statement: Emphasis is on conceptual understanding that changes in genetic material may result in making different proteins.] [Assessment Boundary: Assessment does not include specific changes at the molecular level, mechanisms for protein synthesis, or specific types of mutations.]

MS-LS3-2. Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation. [Clarification Statement:

comparisons.]

HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales. [Clarification Statement: Examples of mathematical representations include finding the average, determining trends, and using graphical comparisons of multiple sets of data.] [Assessment Boundary: Assessment is limited to provided data.]

HS-LS2-3. Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions. [Clarification Statement: Emphasis is on conceptual understanding of the role of aerobic and anaerobic respiration in different environments.] [Assessment Boundary: Assessment does not include the specific chemical processes of either aerobic or anaerobic respiration.]

HS-LS2-4. Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem. [Clarification Statement: Emphasis is on using a mathematical model of stored energy in biomass to describe the transfer of energy from one trophic level to another and that matter and energy are conserved as matter cycles and energy flows through ecosystems. Emphasis is on atoms and molecules such as carbon, oxygen, hydrogen and nitrogen being conserved as they move through an ecosystem.] [Assessment Boundary: Assessment is limited to proportional reasoning to describe the cycling of matter and flow of energy.]

HS-LS2-5. Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere. [Clarification Statement: Examples of models could include simulations and mathematical models.] [Assessment Boundary: Assessment does not include the specific chemical steps of photosynthesis and respiration.]

HS-LS2-6. Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem. [Clarification Statement: Examples of changes in ecosystem conditions could include modest biological or physical changes, such as moderate hunting or a seasonal flood; and, extreme changes, such as volcanic eruption or sea level rise.]

HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.* [Clarification Statement: Examples of human activities can include urbanization, building dams, and dissemination of invasive species.]

HS-LS2-8. Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce. [Clarification Statement: Emphasis is on: (1) distinguishing between group and individual behavior, (2) identifying evidence supporting the outcomes of group behavior, and (3) developing logical and reasonable arguments based on evidence. Examples of group behaviors could include flocking, schooling, herding, and cooperative behaviors such as hunting, migrating, and swarming.]

Heredity: Inheritance and Variation of Traits

HS-LS3-1. Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from

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Students who demonstrate understanding can:	

Emphasis is on using models such as Punnett squares, diagrams, and simulations to describe the cause and effect relationship of gene transmission from parent(s) to offspring and resulting genetic variation.]

Biological Evolution: Unity and Diversity

MS-LS4-1. Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past. [Clarification Statement: Emphasis is on finding patterns of changes in the level of complexity of anatomical structures in organisms and the chronological order of fossil appearance in the rock layers.] [Assessment Boundary: Assessment does not include the names of individual species or geological eras in the fossil record.]

MS-LS4-2. Apply scientific ideas to construct an explanation for the anatomical similarities and differences among modern organisms and between modern and fossil organisms to infer evolutionary relationships. [Clarification Statement: Emphasis is on explanations of the evolutionary relationships among organisms in terms of similarity or differences of the gross appearance of anatomical structures.]

MS-LS4-3. Analyze displays of pictorial data to compare patterns of similarities in the embryological development across multiple species to identify relationships not evident in the fully formed anatomy. [Clarification Statement: Emphasis is on inferring general patterns of relatedness among embryos of different organisms by comparing the macroscopic appearance of diagrams or pictures.] [Assessment Boundary: Assessment of comparisons is limited to gross appearance of anatomical structures in embryological development.]

MS-LS4-4. Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment. [Clarification Statement: Emphasis is on using simple probability statements and proportional reasoning to construct explanations.]

MS-LS4-5. Gather and synthesize information about the technologies that have changed the way humans influence the inheritance of desired traits in organisms. [Clarification Statement: Emphasis is on synthesizing information from reliable sources about the influence of humans on genetic outcomes in artificial selection (such as genetic modification, animal husbandry, gene therapy); and, on the impacts these technologies have on society as well as the technologies leading to these scientific discoveries.]

MS-LS4-6. Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time. [Clarification Statement: Emphasis is on using mathematical models, probability statements, and proportional reasoning to support explanations of trends in changes to populations over time.] [Assessment Boundary: Assessment does not include Hardy Weinberg calculations.]

parents to offspring. [Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.]

HS-LS3-2. Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors. [Clarification Statement: Emphasis is on using data to support arguments for the way variation occurs.] [Assessment Boundary: Assessment does not include the phases of meiosis or the biochemical mechanism of specific steps in the process.]

HS-LS3-3. Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population. [Clarification Statement: Emphasis is on the use of mathematics to describe the probability of traits as it relates to genetic and environmental factors in the expression of traits.] [Assessment Boundary: Assessment does not include Hardy-Weinberg calculations.]

Biological Evolution: Unity and Diversity

HS-LS4-6. Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. [Clarification Statement: Emphasis is on a conceptual understanding of the role each line of evidence has relating to common ancestry and biological evolution. Examples of evidence could include similarities in DNA sequences, anatomical structures, and order of appearance of structures in embryological development.]

HS-LS4-2. Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. [Clarification Statement: Emphasis is on using evidence to explain the influence each of the four factors has on number of organisms, behaviors, morphology, or physiology in terms of ability to compete for limited resources and subsequent survival of individuals and adaptation of species. Examples of evidence could include mathematical models such as simple distribution graphs and proportional reasoning.] [Assessment Boundary: Assessment does not include other mechanisms of evolution, such as genetic drift, gene flow through migration, and co-evolution.]

HS-LS4-3. Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. [Clarification Statement: Emphasis is on analyzing shifts in numerical distribution of traits and using these shifts as evidence to support explanations.] [Assessment Boundary: Assessment is limited to basic statistical and graphical analysis. Assessment does not include allele frequency calculations.]

HS-LS4-4. Construct an explanation based on evidence for how natural selection leads to adaptation of populations. [Clarification Statement: Emphasis is on using data to provide evidence for how specific biotic and abiotic differences in ecosystems (such as ranges of seasonal temperature, long-term climate change, acidity, light, geographic barriers, or evolution of other organisms)

Grade 6-8 students:	Grade 9-12 students:
***Life Science**: LS1From Molecules to Organisms: Structures and Processes; LS2 Ecosystems: Interactions, Energy, and Dynamics; LS3 Heredity: Inheritance and Variation of Traits; LS4 Biological Evolution: Unity and Diversity* *Students who demonstrate understanding can:*	
	contribute to a change in gene frequency over time, leading to adaptation of populations.] **HS-LS4-5. Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.** [Clarification Statement: Emphasis is on determining cause and effect relationships for how changes to the environment such as deforestation, fishing, application of fertilizers, drought, flood, and the rate of change of the environment affect distribution or disappearance of traits in species.] **HS-LS4-6. Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.*** [Clarification Statement: Emphasis is on designing solutions for a proposed problem related to threatened or endangered species, or to genetic variation of organisms for multiple species.]

Earth and Space Science

Grade 6-8 students:	Grade 9-12 students:
***Earth and Space Science:** ESS1 Earth's Place in the Universe; ESS2 Earth's Systems; ESS3 Earth and Human Activity* *Students who demonstrate understanding can:*	
Earth's Place in the Universe **MS-ESS1-1. Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.** [Clarification Statement: Examples of models can be physical, graphical, or conceptual.] **MS-ESS1-2. Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.** [Clarification Statement: Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical (such as the analogy of distance along a football field or computer visualizations of elliptical orbits) or conceptual (such as mathematical proportions relative to the size of familiar objects such as their school or state).] [Assessment Boundary: Assessment does not include Kepler's Laws of orbital motion or the apparent retrograde motion of the planets as viewed from Earth.] **MS-ESS1-3. Analyze and interpret data to determine scale properties of objects in the solar system.** [Clarification Statement: Emphasis is on the analysis of data from Earth-based instruments, space-based telescopes, and spacecraft to determine similarities and differences among solar system objects. Examples of scale properties include the sizes of an object's layers (such as crust and atmosphere), surface features (such as volcanoes), and orbital radius. Examples of data include statistical information, drawings and photographs, and models.] [Assessment Boundary: Assessment does not include recalling facts about properties of the planets and other solar system bodies.] **MS-ESS1-4. Construct a scientific explanation based on evidence from rock**	*Earth's Place in the Universe* **HS-ESS1-1. Develop a model based on evidence to illustrate the life span of the sun and the role of nuclear fusion in the sun's core to release energy that eventually reaches Earth in the form of radiation.** [Clarification Statement: Emphasis is on the energy transfer mechanisms that allow energy from nuclear fusion in the sun's core to reach Earth. Examples of evidence for the model include observations of the masses and lifetimes of other stars, as well as the ways that the sun's radiation varies due to sudden solar flares ("space weather"), the 11-year sunspot cycle, and non-cyclic variations over centuries.] [Assessment Boundary: Assessment does not include details of the atomic and sub-atomic processes involved with the sun's nuclear fusion.] **HS-ESS1-2. Construct an explanation of the Big Bang theory based on astronomical evidence of light spectra, motion of distant galaxies, and composition of matter in the universe.** [Clarification Statement: Emphasis is on the astronomical evidence of the red shift of light from galaxies as an indication that the universe is currently expanding, the cosmic microwave background as the remnant radiation from the Big Bang, and the observed composition of ordinary matter of the universe, primarily found in stars and interstellar gases (from the spectra of electromagnetic radiation from stars), which matches that predicted by the Big Bang theory (3/4 hydrogen and 1/4 helium).] **HS-ESS1-3. Communicate scientific ideas about the way stars, over their life cycle, produce elements.** [Clarification Statement: Emphasis is on the way nucleosynthesis, and therefore the different elements created, varies as a function of the mass of a star and the stage of its lifetime.] [Assessment

Grade 6-8 students:	Grade 9-12 students:

Earth and Space Science: *ESS1 Earth's Place in the Universe; ESS2 Earth's Systems; ESS3 Earth and Human Activity*

Students who demonstrate understanding can:

strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history. [Clarification Statement: Emphasis is on how analyses of rock formations and the fossils they contain are used to establish relative ages of major events in Earth's history. Examples of Earth's major events could range from being very recent (such as the last Ice Age or the earliest fossils of homo sapiens) to very old (such as the formation of Earth or the earliest evidence of life). Examples can include the formation of mountain chains and ocean basins, the evolution or extinction of particular living organisms, or significant volcanic eruptions.] [Assessment Boundary: Assessment does not include recalling the names of specific periods or epochs and events within them.]

Earth's Systems

MS-ESS2-1. Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. [Clarification Statement: Emphasis is on the processes of melting, crystallization, weathering, deformation, and sedimentation, which act together to form minerals and rocks through the cycling of Earth's materials.] [Assessment Boundary: Assessment does not include the identification and naming of minerals.]

MS-ESS2-2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales. [Clarification Statement: Emphasis is on how processes change Earth's surface at time and spatial scales that can be large (such as slow plate motions or the uplift of large mountain ranges) or small (such as rapid landslides or microscopic geochemical reactions), and how many geoscience processes (such as earthquakes, volcanoes, and meteor impacts) usually behave gradually but are punctuated by catastrophic events. Examples of geoscience processes include surface weathering and deposition by the movements of water, ice, and wind. Emphasis is on geoscience processes that shape local geographic features, where appropriate.]

MS-ESS2-3. Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions. [Clarification Statement: Examples of data include similarities of rock and fossil types on different continents, the shapes of the continents (including continental shelves), and the locations of ocean structures (such as ridges, fracture zones, and trenches).] [Assessment Boundary: Paleomagnetic anomalies in oceanic and continental crust are not assessed.]

MS-ESS2-4. Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity. [Clarification Statement: Emphasis is on the ways water changes its state as it moves through the multiple pathways of the hydrologic cycle. Examples of models can be conceptual or physical.] [Assessment Boundary: A quantitative understanding of the latent heats of vaporization and fusion is not assessed.]

MS-ESS2-5. Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions. [Clarification Statement: Emphasis is on how air masses flow from regions of high pressure to low pressure, causing weather (defined by temperature, pressure, humidity, precipitation, and wind) at a fixed location to change over time, and how sudden changes in weather can result when different air masses collide. Emphasis is on how weather can be predicted within probabilistic ranges. Examples of data can be provided to students (such as weather maps, diagrams, and visualizations) or obtained through laboratory experiments (such as with condensation).] [Assessment Boundary: Assessment does not include recalling the names of cloud types or weather symbols used on weather maps or the reported diagrams from weather stations.]

Boundary: Details of the many different nucleosynthesis pathways for stars of differing masses are not assessed.]

HS-ESS1-4. Use mathematical or computational representations to predict the motion of orbiting objects in the solar system. [Clarification Statement: Emphasis is on Newtonian gravitational laws governing orbital motions, which apply to human-made satellites as well as planets and moons.] [Assessment Boundary: Mathematical representations for the gravitational attraction of bodies and Kepler's Laws of orbital motions should not deal with more than two bodies, nor involve calculus.]

HS-ESS1-5. Evaluate evidence of the past and current movements of continental and oceanic crust and the theory of plate tectonics to explain the ages of crustal rocks. [Clarification Statement: Emphasis is on the ability of plate tectonics to explain the ages of crustal rocks. Examples include evidence of the ages oceanic crust increasing with distance from mid-ocean ridges (a result of plate spreading) and the ages of North American continental crust increasing with distance away from a central ancient core (a result of past plate interactions).]

HS-ESS1-6. Apply scientific reasoning and evidence from ancient Earth materials, meteorites, and other planetary surfaces to construct an account of Earth's formation and early history. [Clarification Statement: Emphasis is on using available evidence within the solar system to reconstruct the early history of Earth, which formed along with the rest of the solar system 4.6 billion years ago. Examples of evidence include the absolute ages of ancient materials (obtained by radiometric dating of meteorites, moon rocks, and Earth's oldest minerals), the sizes and compositions of solar system objects, and the impact cratering record of planetary surfaces.]

Earth's Systems

HS-ESS2-1. Develop a model to illustrate how Earth's internal and surface processes operate at different spatial and temporal scales to form continental and ocean-floor features. [Clarification Statement: Emphasis is on how the appearance of land features (such as mountains, valleys, and plateaus) and sea-floor features (such as trenches, ridges, and seamounts) are a result of both constructive forces (such as volcanism, tectonic uplift, and orogeny) and destructive mechanisms (such as weathering, mass wasting, and coastal erosion).] [Assessment Boundary: Assessment does not include memorization of the details of the formation of specific geographic features of Earth's surface.]

HS-ESS2-2. Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth's systems. [Clarification Statement: Examples should include climate feedbacks, such as how an increase in greenhouse gases causes a rise in global temperatures that melts glacial ice, which reduces the amount of sunlight reflected from Earth's surface, increasing surface temperatures and further reducing the amount of ice. Examples could also be taken from other system interactions, such as how the loss of ground vegetation causes an increase in water runoff and soil erosion; how dammed rivers increase groundwater recharge, decrease sediment transport, and increase coastal erosion; or how the loss of wetlands causes a decrease in local humidity that further reduces the wetland extent.]

HS-ESS2-3. Develop a model based on evidence of Earth's interior to describe the cycling of matter by thermal convection. [Clarification Statement: Emphasis is on both a one-dimensional model of Earth, with radial layers determined by density, and a three-dimensional model, which is controlled by mantle convection and the resulting plate tectonics. Examples of evidence include maps of Earth's three-dimensional structure obtained from seismic waves, records of the rate of change of Earth's magnetic field (as

Grade 6-8 students:	Grade 9-12 students:

Earth and Space Science: *ESS1 Earth's Place in the Universe; ESS2 Earth's Systems; ESS3 Earth and Human Activity*

Students who demonstrate understanding can:

MS-ESS2-6. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates. [Clarification Statement: Emphasis is on how patterns vary by latitude, altitude, and geographic land distribution. Emphasis of atmospheric circulation is on the sunlight-driven latitudinal banding, the Coriolis effect, and resulting prevailing winds; emphasis of ocean circulation is on the transfer of heat by the global ocean convection cycle, which is constrained by the Coriolis effect and the outlines of continents. Examples of models can be diagrams, maps and globes, or digital representations.] [Assessment Boundary: Assessment does not include the dynamics of the Coriolis effect.]

Earth and Human Activity

MS-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes. [Clarification Statement: Emphasis is on how these resources are limited and typically non-renewable, and how their distributions are significantly changing as a result of removal by humans. Examples of uneven distributions of resources as a result of past processes include but are not limited to petroleum (locations of the burial of organic marine sediments and subsequent geologic traps), metal ores (locations of past volcanic and hydrothermal activity associated with subduction zones), and soil (locations of active weathering and/or deposition of rock).]

MS-ESS3-2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects. [Clarification Statement: Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).]

MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.* [Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).]

MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. [Clarification Statement: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make

constraints on convection in the outer core), and identification of the composition of Earth's layers from high-pressure laboratory experiments.]

HS-ESS2-4. Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate. [Clarification Statement: Examples of the causes of climate change differ by timescale, over 1-10 years: large volcanic eruption, ocean circulation; 10-100s of years: changes in human activity, ocean circulation, solar output; 10-100s of thousands of years: changes to Earth's orbit and the orientation of its axis; and 10-100s of millions of years: long-term changes in atmospheric composition.] [Assessment Boundary: Assessment of the results of changes in climate is limited to changes in surface temperatures, precipitation patterns, glacial ice volumes, sea levels, and biosphere distribution.]

HS-ESS2-5. Plan and conduct an investigation of the properties of water and its effects on Earth materials and surface processes. [Clarification Statement: Emphasis is on mechanical and chemical investigations with water and a variety of solid materials to provide the evidence for connections between the hydrologic cycle and system interactions commonly known as the rock cycle. Examples of mechanical investigations include stream transportation and deposition using a stream table, erosion using variations in soil moisture content, or frost wedging by the expansion of water as it freezes. Examples of chemical investigations include chemical weathering and recrystallization (by testing the solubility of different materials) or melt generation (by examining how water lowers the melting temperature of most solids).]

HS-ESS2-6. Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere. [Clarification Statement: Emphasis is on modeling biogeochemical cycles that include the cycling of carbon through the ocean, atmosphere, soil, and biosphere (including humans), providing the foundation for living organisms.]

HS-ESS2-7. Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth. [Clarification Statement: Emphasis is on the dynamic causes, effects, and feedbacks between the biosphere and Earth's other systems, whereby geoscience factors control the evolution of life, which in turn continuously alters Earth's surface. Examples of include how photosynthetic life altered the atmosphere through the production of oxygen, which in turn increased weathering rates and allowed for the evolution of animal life; how microbial life on land increased the formation of soil, which in turn allowed for the evolution of land plants; or how the evolution of corals created reefs that altered patterns of erosion and deposition along coastlines and provided habitats for the evolution of new life forms.] [Assessment Boundary: Assessment does not include a comprehensive understanding of the mechanisms of how the biosphere interacts with all of Earth's other systems.]

Earth and Human Activity

HS-ESS3-1. Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. [Clarification Statement: Examples of key natural resources include access to fresh water (such as rivers, lakes, and groundwater), regions of fertile soils such as river deltas, and high concentrations of minerals and fossil fuels. Examples of natural hazards can be from interior processes (such as volcanic eruptions and earthquakes), surface processes (such as tsunamis, mass wasting and soil erosion), and severe weather (such as hurricanes, floods, and droughts). Examples of the results of changes in climate that can affect populations or drive mass migrations include changes to sea level, regional patterns of temperature and precipitation, and the types of crops and livestock that can be raised.]

**HS-ESS3-2. Evaluate competing design solutions for developing, managing, and

Grade 6-8 students:	Grade 9-12 students:
Earth and Space Science: *ESS1 Earth's Place in the Universe; ESS2 Earth's Systems; ESS3 Earth and Human Activity* *Students who demonstrate understanding can:*	
the decisions for the actions society takes.] **MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.** [Clarification Statement: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.]	**utilizing energy and mineral resources based on cost-benefit ratios.*** [Clarification Statement: Emphasis is on the conservation, recycling, and reuse of resources (such as minerals and metals) where possible, and on minimizing impacts where it is not. Examples include developing best practices for agricultural soil use, mining (for coal, tar sands, and oil shales), and pumping (for petroleum and natural gas). Science knowledge indicates what can happen in natural systems—not what should happen.] **HS-ESS3-3. Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.** [Clarification Statement: Examples of factors that affect the management of natural resources include costs of resource extraction and waste management, per-capita consumption, and the development of new technologies. Examples of factors that affect human sustainability include agricultural efficiency, levels of conservation, and urban planning.] [Assessment Boundary: Assessment for computational simulations is limited to using provided multi-parameter programs or constructing simplified spreadsheet calculations.] **HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.*** [Clarification Statement: Examples of data on the impacts of human activities could include the quantities and types of pollutants released, changes to biomass and species diversity, or areal changes in land surface use (such as for urban development, agriculture and livestock, or surface mining). Examples for limiting future impacts could range from local efforts (such as reducing, reusing, and recycling resources) to large-scale geoengineering design solutions (such as altering global temperatures by making large changes to the atmosphere or ocean).] **HS-ESS3-5. Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.** [Clarification Statement: Examples of evidence, for both data and climate model outputs, are for climate changes (such as precipitation and temperature) and their associated impacts (such as on sea level, glacial ice volumes, or atmosphere and ocean composition).] [Assessment Boundary: Assessment is limited to one example of a climate change and its associated impacts.] **HS-ESS3-6. Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.** [Clarification Statement: Examples of Earth systems to be considered are the hydrosphere, atmosphere, cryosphere, geosphere, and/or biosphere. An example of the far-reaching impacts from a human activity is how an increase in atmospheric carbon dioxide results in an increase in photosynthetic biomass on land and an increase in ocean acidification, with resulting impacts on sea organism health and marine populations.] [Assessment Boundary: Assessment does not include running computational representations but is limited to using the published results of scientific computational models.]

Engineering Design

Grade 6-8 students:	Grade 9-12 students:
Engineering Design: *Students who demonstrate understanding can:*	
	HS-ETS1-1. Analyze a major global challenge to specify qualitative and

Grade 6-8 students:	**Grade 9-12 students:**
Engineering Design: *Students who demonstrate understanding can:*	
MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. **MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.** **MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.** **MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.**	**quantitative criteria and constraints for solutions that account for societal needs and wants.** **HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.** **HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.** **HS-ETS1-4. Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.**

SOCIAL STUDIES

The primary purpose of social studies is to develop the ability to make informed and reasoned decisions for the public good as citizens of a culturally diverse, democratic society in an interdependent world (National Council of the Social Studies, 1994, p.3). The great architects of American public education, such as Thomas Jefferson, Horace Mann, and John Dewey, believed that every student must be well versed in our nation's history, the principles and practices which undergird citizenship, and the institutions that define our government. Understandings of commerce and geography were critical to their thinking as well. In essence, Jefferson, Mann, and Dewey viewed the study of social studies as critical to the mission of public schools. Indeed, they would applaud the inclusion of a "responsible and involved citizen" in the Guiding Principles, as well as social studies as one of eight content areas in the *Learning Results*.

A strong social studies education depends upon a clear understanding of its interrelated disciplines. Without knowledge of the geography and economics of earlier times, history offers only lists of people, events, and dates. Without knowledge of history, the institutions of American government and the dynamics of today's global economy are difficult to understand. Although social studies curricula vary in their breadth and depth, the Social Studies Standards reflect a focus on government, history, geography, and economics as the pillars of the content, with other disciplines within the social sciences deemed important, but not essential.

Key Ideas in the Social Studies Standards:

Understand - The word “understand” appears in performance indicators throughout the Social Studies Standards. It refers to a variety of different levels on Bloom’s taxonomy and was used intentionally to serve as an umbrella term for the cognitive demand that is described by the descriptors beneath the performance indicators. Look to the descriptors to define the level of cognitive demand for student performance.

Various -The Social Studies Standards refer to “various" peoples, nations, regions of the world, historical eras, and enduring themes. School administrative units should develop a local curriculum that assists students in gaining a coherent, broad perspective on a variety of peoples, nations, regions, historical eras, and enduring themes.

Major Enduring Themes - The term “major enduring themes” is used in several places in the Social Studies Standards. This term refers to general topics or issues that have been relevant over a long period of time. Using a consistent set of themes can serve as a framework within which other concepts, topics, and facts can be organized. It can also help students make connections between events within and across historical eras, and use history to help make informed decisions. Four different lists of major themes are provided, and schools may select from them based on their judgment of which list will best serve the learning of their students.

Eras – School Administrative Units (SAU) should develop a coherent curriculum that provides students with a balanced exposure to the major eras of United States and World History. The term "various eras" in this document refers to those eras that are selected by an SAU to build a cohesive, balanced understanding. The "eras", some of which overlap, include:

Eras in United States History	Eras in World History
1. The Americas to 1600 2. The Colonial Era, 1500-1754 3. The Revolutionary Era, 1754-1783 4. Nation Building, 1783-1815 5. The Expanding Nation, 1815-1850 6. Civil War and Reconstruction, 1850-1877 7. Development of the Industrial United States, 1865-1914 8. The Progressive Era, 1890-1914 9. Emergence of the United States as a World Power, 1890-1920 10. The 1920's: Prosperity and Problems 11. The Depression and The New Deal, 1929-1941 12. World War II and Postwar United States, 1939-1961 13. Contemporary United States, 1961-Present	1. The Emergence of Civilization to 1000 BC 2. The Classical Civilizations of the Mediterranean Basin, India, and China, 1000 BC – 600 AD 3. The Expansion and Interaction of Civilizations, 600 AD – 1450 AD 4. The Early Modern World, 1450 – 1800 5. The World in the Nineteenth Century 6. The World in the Contemporary Era

Maine Native Americans - The phrase Maine Native Americans refers to the four Maine Native American tribes – the Penobscot, the Passamaquoddy, the Micmac, and the Maliseet.

Unity and Diversity - The Civics and Government, Economics, Geography, and History Standards all include performance indicators that address individual, cultural, international, and global connections. It will be up to the SAU to determine whether they use these performance indicators as an opportunity to integrate across the disciplines of the social studies or address them separately. In whatever manner the SAU addresses the instruction related to these performance indicators, it is critical that schools understand the importance of addressing the issues that both unify and divide. The following should help to provide clarity about the ideas related to unity and diversity that are contained in these performance indicators.

Unity and Diversity - The concepts of "unity" and "diversity" apply to the Civics and Government, Economics, Geography, and History Standards in Social Studies. Unity and diversity have long been valued in the United States as foundations of the unique character of our society. People throughout our nation's history have come from distinct and varied cultural, political, and religious backgrounds and perspectives. They have helped to shape and have participated in our national life based on the shared democratic values represented in our founding documents. We build common bonds of unity based on the democratic values, processes, and institutions that support our democratic way of life. At the same time we recognize the unique contributions, traditions, and perspectives of various groups and cultures. The concepts of unity and diversity also play a role in geography and economics. Diversity and unity influence the settlement and the economics of communities, regions, and nations. For example, in some cases a geographic factor such as a river serves as a resource that may bind a region, community, or a group of people of similar ethnic origins together. Economic systems or activities may unify a community or region; in other cases economic influences may lead to economic diversity. **The Social Studies Standards define the essential knowledge related to the concepts of unity and diversity under the broad umbrella of the performance indicators set forth at B3, C2, D2, and E2 which address Individual, Cultural, International, and Global Connections in civics and government, economics, geography, and history, respectively.**

Embedded Definition of the Social Studies Disciplines - The first performance indicator of each of these disciplines includes a descriptor that provides a definition of each of these disciplines that develops across the grade spans. This series of descriptors provides a developmentally appropriate picture of what is learned in the discipline, and should help to ensure that students will be able to distinguish among the disciplines of the social studies and what the individuals engaged in those areas of study do, and to understand which discipline or combinations of disciplines best address specific topics and issues.

OUTLINE OF SOCIAL STUDIES STANDARDS AND PERFORMANCE INDICATOR LABELS

A. Applications of Social Studies Processes, Knowledge, and Skills
1. Researching and Developing Positions on Current Social Studies Issues
2. Making Decisions Using Social Studies Knowledge and Skills
3. Taking Action Using Social Studies Knowledge and Skills
B. Civics and Government
1. Knowledge, Concepts, Themes, and Patterns of Civics/Government
2. Rights, Duties, Responsibilities, and Citizen Participation in Government
3. Individual, Cultural, International, and Global Connections in Civics and Government
C. Economics
1. Economic Knowledge, Concepts, Themes, and Patterns
2. Individual, Cultural, International, and Global Connections in Economics
D. Geography
1. Geographic Knowledge, Concepts, Themes, and Patterns
2. Individual, Cultural, International, and Global Connections in Geography
E. History
1. Historical Knowledge, Concepts, Themes, and Patterns

2. Individual, Cultural, International, and Global Connections in History

A.<u>**Applications of Social Studies Processes, Knowledge, and Skills:**</u> **Students apply critical thinking, a research process, and *discipline-based processes* and knowledge from civics/government, economics, geography, and history in *authentic contexts*.**

A1 Researching and Developing Positions on Current Social Studies Issues

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify and investigate research questions related to social studies by locating, organizing, and sharing information. a. Identify questions related to social studies. b. Follow an established procedure for locating sources appropriate to reading level. c. Locate and collect information for a specific purpose from sources including maps, photographs, charts, and graphs. d. Organize findings. e. Share information gathered using oral and visual examples.	**Students identify and answer research questions related to social studies, by locating and selecting information and presenting findings.** a. Identify research questions related to social studies - seeking multiple perspectives from varied sources. b. Identify key words and concepts related to research questions, making adjustments when necessary. c. Locate and access information by using *text features*. d. Collect, evaluate, and organize for a specific purpose. e. Communicate findings from a variety *of print and non-print sources*. f. Describe plagiarism and demonstrate appropriate *citation*. g. Distinguish between facts and opinions/interpretations in sources.	**Students research, select, and present a position on a *current social studies issue* by proposing and revising research questions, and locating and selecting information from multiple and varied sources.** a. Propose and revise research questions related to a *current social studies issue*. b. Determine the nature and extent of information needed. c. Locate and access relevant information that includes multiple perspectives from varied sources. d. Demonstrate facility with note-taking, organizing information, and creating bibliographies. e. Distinguish between *primary and secondary sources*. f. Evaluate and verify the credibility of the information found in *print and non-print sources.* g. Use additional sources to resolve contradictory information. h. Summarize and interpret	**Students research, develop, present, and defend positions on *current social studies issues* by developing and modifying research questions, and locating, selecting, evaluating, and synthesizing information from multiple and varied sources.** a. Develop research questions related to a *current social studies issue.* b. Select and apply research methods that are appropriate for the purpose of the inquiry. c. Make judgments about conflicting findings from different sources, incorporating those from sources that are valid and refuting others. d. Synthesize information from varied sources, fieldwork, experiments, and/or interviews that reflect multiple perspectives. e. Utilize media relevant to audience and purpose that extend and support oral, written, and visual communication. f. Create and present a coherent set of

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
		information found in varied sources and/or from fieldwork, experiments, and interviews. i. Select a clear supportable position. j. Present a well-supported position, based on findings that integrate paraphrasing, quotations, and citations, to a *variety of audiences*. k. Use appropriate tools, methods, and sources from government, history, geography, economics, or related fields. l. Use information ethically and legally.	findings that integrate paraphrasing, quotations, and *citations*. g. Develop a clear well -supported position. h. Present and defend a well-supported position to a *variety of audiences* using a prescribed format. i. Select and use appropriate tools, methods, and sources from government, history, geography, economics, or related fields, including *ethical reasoning skills*. j. Access and present information ethically and legally.

A2 Making Decisions Using Social Studies Knowledge and Skills

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students make individual and collaborative decisions on matters related to social studies using research and discussion skills. a. Share ideas and listen to the ideas of others to reach individual and collaborative decisions and make plans. b. Make a *real or simulated decision*	**Students make individual and collaborative decisions on matters related to social studies using relevant information and research and discussion skills.** a. Contribute equitably to collaborative discussions, examine alternative ideas, and work cooperatively to share ideas, and individually and	**Students make individual and collaborative decisions on matters related to social studies using relevant information and research and discussion skills.** a. Develop individual and collaborative decisions/plans by contributing equitably to collaborative discussions, seeking and	**Students make individual and collaborative decisions on matters related to social studies using relevant information and research, discussion, and *ethical reasoning skills*.** a. Develop individual and collaborative decisions/plans by considering multiple points of view, weighing

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
related to the classroom, school, or beyond by applying appropriate and relevant social studies skills, including research skills, and relevant information.	collaboratively develop a decision or plan. b. Make a *real or simulated decision* related to the classroom, school, community, or civic organization by applying appropriate and relevant social studies knowledge and skills, including research skills, and other relevant information.	examining alternative ideas, considering the pros and cons, and thoughtfully and respectfully recognizing the contributions of other group members. b. Make a *real or simulated decision* related to the classroom, school, community, civic organization, Maine, or beyond by applying appropriate and relevant social studies knowledge and skills, including research skills, and other relevant information.	pros and cons, building on the ideas of others, and sharing information in an attempt to sway the opinions of others. b. Make a *real or simulated decision* related to the classroom, school, community, civic organization, Maine, United States, or international entity by applying appropriate and relevant social studies knowledge and skills, including research skills, *ethical reasoning skills*, and other relevant information.

A3 Taking Action Using Social Studies Knowledge and Skills

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students select, plan, and participate in a *civic action* or *service-learning* project based on a classroom or school asset or need, and describe the project's potential civic contribution.	**Students select, plan, and participate in a *civic action* or *service-learning* project based on a classroom, school or local community asset or need, and describe evidence of the project's effectiveness and civic contribution.**	**Students select, plan, and implement a *civic action* or *service-learning* project based on a school, community, or State asset or need, and analyze the project's effectiveness and civic contribution.**	**Students select, plan, and implement a *civic action* or *service-learning* project based on a community, school, State, national, or international asset or need, and evaluate the project's effectiveness and civic contribution.**

B.Civics and Government: Students draw on concepts from civics and government to understand political systems, power, authority, governance, civic ideals and practices, and the role of citizens in the community, Maine, the United States, and world.

B1 Knowledge, Concepts, Themes, and Patterns of Civics/Government

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students understand key ideas and processes that characterize democratic government in the community and the United States. a. Describe and provide examples of *democratic ideals*. b. Recognize symbols, monuments, celebrations, and leaders of local, State, and national government. c. Identify community workers and volunteers and the roles they play in promoting the common good.	**Students understand the basic ideals, purposes, principles, structures, and processes of democratic government in Maine and the United States.** a. Explain that the study of government includes how governments are organized and how citizens participate. b. Explain and provide examples of *democratic ideals* and *constitutional principles* to include the rule of law, legitimate power, and common good. c. Explain and give examples of *governmental structures* including the legislative, executive, and judicial branches and the local, State, and national levels of government. d. Explain how leaders are elected and how laws are made and implemented. e. Explain that the *structures* and processes *of government* are described in documents, including	**Students understand the basic ideals, purposes, principles, structures, and processes of constitutional government in Maine and the United States as well as examples of other forms of government in the world.** a. Explain that the study of government includes the *structures* and functions of government and the political and civic activity of citizens. b. Analyze examples of *democratic ideals* and *constitutional principles* that include the rule of law, legitimate power, and common good. c. Describe the *structures* and processes of United States government and government of the State of Maine and how these are framed by the United States Constitution, the Maine Constitution, and other primary sources. d. Explain the concepts of federalism	**Students understand the ideals, purposes, principles, structures, and processes of constitutional government in the United States and in the American political system, as well as examples of other forms of government and political systems in the world.** a. Explain that the study of government includes the *structures*, functions, institutions, and forms of government and the relationship of government to citizens in the United States and in other regions of the world. b. Evaluate *current issues* by applying *democratic ideals* and *constitutional principles* of government in the United States, including checks and balances, federalism, and consent of the governed as put forth in *founding documents*. c. Explain how and why democratic institutions and interpretations of *democratic ideals* and

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
	the Constitutions of Maine and the United States.	and checks and balances and the role these concepts play in the governments of the United States and Maine as framed by the United States Constitution, the Maine Constitution and other primary sources. e. Compare how laws are made in Maine and at the federal level in the United States. f. Compare the *structures* and processes of United States government with examples of other forms of government.	*constitutional principles* change over time. d. Describe the purpose, structures, and processes of the *American political system*. e. Compare the *American political system* with examples of political systems from other parts of the world.

B2 Rights, Duties, Responsibilities, and Citizen Participation in Government

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students understand the concepts of *rights, duties, responsibilities,* and participation. a. Describe classroom *rights, duties, and responsibilities* including how students participate in some classroom decisions and are obliged to follow classroom rules. b. Explain the purpose of school/classroom rules and laws encountered in daily experiences	**Students understand the basic *rights, duties, responsibilities,* and roles of citizens in a democracy.** a. Identify the *rights, duties, and responsibilities* of citizens within the class, school, or community. b. Identify and describe the United States Constitution and Bill of Rights as documents that establish government and protect the rights of the individual United	**Students understand constitutional and legal *rights*, civic *duties and responsibilities*, and roles of citizens in a constitutional democracy.** a. Explain the constitutional and legal status of "citizen" and provide examples of *rights, duties, and responsibilities* of citizens. b. Describe how the powers of government are limited to protect	**Students understand the constitutional and legal *rights*, the civic *duties and responsibilities,* and roles of citizens in a constitutional democracy and the role of citizens living under other forms of government in the world.** a. Explain the relationship between constitutional and legal *rights*, and civic *duties and responsibilities* in a constitutional democracy.

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
to promote the common good and the peaceful resolution of conflict.	States citizen. c. Provide examples of how people influence government and work for the common good including voting, writing to legislators, performing community service, and engaging in civil disobedience.	individual rights and minority rights as described in the United States Constitution and the Bill of Rights. c. Analyze examples of the protection of rights in court cases or from current events. d. Analyze how people influence government and work for the common good including voting, writing to legislators, performing community service, and engaging in civil disobedience.	b. Evaluate the relationship between the government and the individual as evident in the United States Constitution, the Bill of Rights, and landmark court cases. c. Analyze the *constitutional principles* and the roles of the citizen and the government in major laws or cases. d. Compare the *rights, duties, and responsibilities* of United States citizens with those of citizens from other nations. e. Evaluate how people influence government and work for the common good including voting, writing to legislators, performing community service, and engaging in civil disobedience.

B3 Individual, Cultural, International, and Global Connections in Civics and Government

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students understand civic aspects of classroom traditions and decisions, and the traditions of various cultures, including Maine Native Americans. a. Identify and compare similar and	**Students understand civic aspects of unity and diversity in the daily life of various cultures in the United States and the world, including Maine Native Americans.** a. Identify examples of unity and	**Students understand political and civic aspects of unity and diversity in Maine, the United States, and various world cultures including Maine Native Americans.** a. Explain basic constitutional, political,	**Students understand political and civic aspects of unity and diversity in Maine, the United States, and the world, including Maine Native Americans.** a. Analyze the constitutional, political,

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
differing interests and opinions students have related to classroom traditions and decisions. b. Compare traditions that are similar across the nation and traditions that differ in various cultural groups including Maine Native Americans.	diversity in the United States that relate to how laws protect individuals or groups to support the common good. b. Describe civic beliefs and activities in the daily life of diverse cultures, including Maine Native Americans and various cultures in the United States and the world.	and civic aspects of historical and/or *current issues* that involve unity and diversity in Maine, the United States, and other nations. b. Describe the *political structures* and civic responsibilities within diverse cultures, including Maine Native Americans, various *historical and recent immigrant groups* in the United States, and various cultures in the world.	and civic aspects of historical and/or *current issues* that involve unity and diversity in Maine, the United States, and other nations. b. Analyze the *political structures*, political power, and political perspectives of diverse cultures, including those of Maine and other Native Americans, various *historical and recent immigrant groups* in Maine and the United States, and those of various world cultures.

C. Economics: Students draw on concepts and processes from economics to understand issues of *personal finance* and issues of production, distribution, and consumption in the community, Maine, the United States, and world.

C1 Economic Knowledge, Concepts, Themes, and Patterns

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students understand the nature of economics as well as key foundation ideas. a. Describe economics as how people make choices about how to use *scarce resources* to meet their wants and needs.	**Students understand personal economics and the basis of the economies of the community, Maine, the United States, and various regions of the world.** a. Explain that economics includes the study of scarcity which leads to	**Students understand the principles and processes of personal economics, the influence of economics on personal life and business, and the *economic systems* of Maine, the United States, and various regions of the world.**	**Students understand the principles and processes of personal economics, the role of markets, the *economic system* of the United States, and other *economic systems* in the world, and how economics serves to inform decisions in the present and future.**

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
b. Describe how money is earned and managed in order to buy *goods and services* and save for the future.	economic choices about what *goods and services* will be produced, how they will be distributed, and for whom they will be produced. b. Explain how *entrepreneurs* and other producers of *goods and services* help satisfy the wants and needs of consumers in a *market economy*, locally and nationally, by using *natural, human*, and *capital resources*. c. Describe situations in which personal choices are related to the use of financial resources and financial institutions including the use of money, consumption, savings, investment, and banking.	a. Explain that economics is the study of how scarcity requires choices about what, how, for whom, and in what quantity to produce, and how scarcity relates to *market economy, entrepreneurship, supply and demand,* and *personal finance.* b. Describe the functions of *economic institutions* and *economic processes* including financial institutions, businesses, government, taxing, and trade. c. Identify factors that contribute to personal spending and savings decisions including work, wages, income, expenses, and budgets as they relate to the study of individual financial choices.	a. Explain that the study of economics includes the analysis and description of production, distribution, and consumption of *goods and services* by business, and is the basis of individual *personal finance* management including saving and investing. b. Explain and analyze the role of financial institutions, the stock market, and government, including *fiscal, monetary, and trade policies*, in personal, business, and national economics. c. Evaluate different forms of money management, and the positive and negative impacts that credit can have on individual finances, using *economic reasoning*. d. Identify and explain various *economic indicators* and how they represent and influence economic activity. e. Analyze economic activities and policies in relationship to freedom, efficiency, equity, security, growth, and sustainability. f. Explain and apply the concepts of *specialization, economic interdependence,* and *comparative*

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
			advantage. g. Solve problems using the theory of *supply and demand.*

C2 Individual, Cultural, International, and Global Connections in Economics

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students understand the influence of economics on individuals and groups in the United States and the world, including Maine Native Americans. a. Identify examples of how individuals, families, and communities, including Maine Native Americans, are influenced by *economic factors.* b. Describe the work and contribution of various groups to the economics of the local community in the past and present.	**Students understand economic aspects of unity and diversity in the community, Maine, and regions of the United States and the world, including Maine Native American communities.** a. Describe economic similarities and differences within the community, Maine, and the United States. b. Identify *economic processes*, *economic institutions*, and economic influences related to Maine Native Americans and various cultures in the United States and the world.	**Students understand economic aspects of unity and diversity in Maine, the United States, and various world cultures, including Maine Native Americans.** a. Describe factors in *economic development*, and how states, regions, and nations have worked together to promote economic unity and interdependence. b. Describe the economic aspects of diverse cultures, including Maine Native Americans, various historical and recent immigrant groups in the United States, and various cultures in the world.	**Students understand economic aspects of unity and diversity in Maine, the United States, and the world, including Maine Native American communities.** a. Analyze the role of regional, international, and global organizations that are engaged in *economic development.* b. Compare a variety of *economic systems* and the *economic development* of Maine, the United States, and various regions of the world that are economically diverse. c. Analyze wealth, poverty, resource distribution, and other *economic factors* of diverse cultures, including Maine and other Native Americans, various historical and recent immigrant groups in Maine and the United States, and various

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
			world cultures.

D.Geography: Students draw on concepts and processes from geography to understand issues involving people, places, and environments in the community, Maine, the United States, and world.

D1 Geographic Knowledge, Concepts, Themes, and Patterns

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students understand the nature and basic ideas of geography. a. Explain that geography is the study of the Earth's surface and peoples. b. Create visual representations of the immediate neighborhood and community. c. Use basic maps and globes to identify local and distant *places* and *locations*, directions (including N, S, E, and W), and basic physical, environmental, and cultural features.	**Students understand the geography of the community, Maine, the United States, and various regions of the world.** a. Explain that geography includes the study of Earth's physical features including climate and the distribution of plant, animal, and human life. b. Create visual representations of the world, showing a basic understanding of the *geographic grid*, including the equator and prime meridian. c. Identify the Earth's major geographic features such as continents, oceans, major mountains, and rivers using a variety of *geographic tools*.	**Students understand the geography of the community, Maine, the United States, and various regions of the world and the geographic influences on life in the past, present, and future.** a. Explain that geography includes the study of physical, environmental, and cultural features of the State, nation, and various regions of the world to identify consequences of geographic influences and make predictions. b. Use the *geographic grid* and a variety of *types of maps* to gather geographic information. c. Identify the major regions of the Earth and their major physical features and political boundaries	**Students understand the geography of the United States and various regions of the world and the effect of geographic influences on decisions about the present and future.** a. Explain that geography includes the study of physical, environmental, and cultural features at the local, state, national, and global levels and helps people to better predict and evaluate consequences of geographic influences. b. Describe the major regions of the Earth and their major physical, environmental, and cultural features using a variety of *geographic tools*. c. Analyze local, national, and global

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
	d. Explain examples of changes in the Earth's physical features and their impact on communities and regions.	using a variety of *geographic tools*. d. Describe the impact of change, including technological change, on the physical and cultural environment.	geographic data on physical, environmental, and cultural processes that shape and change places and regions. d. Evaluate the impact of change, including technological change, on the physical and cultural environment.

D2 Individual, Cultural, International, and Global Connections in Geography

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students understand the influence of geography on individuals and groups in the United States and the world, including Maine Native Americans. a. Identify the impacts of geographic features on individuals, families, and communities, including Maine Native Americans, in the United States and various other nations.	**Students understand geographic aspects of unity and diversity in the community, Maine, and regions of the United States and the world, including Maine Native American communities.** a. Identify examples of how geographic features unify communities and regions as well as support diversity. b. Describe impacts of geographic features on the daily life of various cultures, including Maine Native Americans and other cultures in the United States and the world.	**Students understand geographic aspects of unity and diversity in Maine, the United States, and various world cultures, including Maine Native Americans.** a. Explain geographic features that have impacted unity and diversity in Maine, the United States, and other nations. b. Describe the dynamic relationship between geographic features and various cultures, including the cultures of Maine Native Americans, various historical and recent immigrant groups in the United States, and other cultures in the world.	**Students understand geographic aspects of unity and diversity in Maine, the United States, and the world, including Maine Native American communities.** a. Analyze geographic features that have impacted unity and diversity in the United States and other nations and describe their effects. b. Analyze the dynamic relationship between geographic features and various cultures, including the cultures of Maine and other Native Americans, various historical and recent immigrant groups in the United States, and other cultures in the world.

E.History: Students draw on concepts and processes from history to develop *historical* perspective and understand issues of continuity and change in the community, Maine, the United States, and world.

E1 Historical Knowledge, Concepts, Themes, and Patterns

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students understand the nature of history as well as key foundation ideas. a. Describe history as "stories" of the past. b. Identify a few key figures and events from personal history, and the history of the community, Maine, and the United States, especially those associated with historically-based traditions. c. Identify past, present, and future in stories, pictures, poems, songs, or videos. d. Apply terms such as "before" and "after" in sequencing events. e. Create a brief *historical* account about family, the local community, or the nation by using artifacts, photographs, or stories of the past.	**Students understand various major eras in the history of the community, Maine, and the United States.** a. Explain that history includes the study of past human experience based on available evidence from a variety of sources. b. Identify various major *historical* eras, major enduring themes, turning points, events, consequences, persons, and timeframes, in the history of the community, Maine, and the United States. c. Trace and explain how the history of democratic principles is preserved in *historic symbols, monuments, and traditions* important in the community, Maine, and the United States.	**Students understand major eras, major enduring themes, and *historic* influences in the history of Maine, the United States, and various regions of the world.** a. Explain that history includes the study of past human experience based on available evidence from a variety of sources; and explain how history can help one better understand and make informed decisions about the present and future. b. Identify and analyze major *historical* eras, major enduring themes, turning points, events, consequences, and people in the history of Maine, the United States and various regions of the world. c. Trace and explain the history of *democratic ideals* and *constitutional principles* and their importance in the history of the	**Students understand major eras, major enduring themes, and *historic* influences in United States and world history, including the roots of democratic philosophy, ideals, and institutions in the world.** a. Explain that history includes the study of the past based on the examination of a variety of *primary and secondary sources* and how history can help one better understand and make informed decisions about the present and future. b. Analyze and critique major *historical* eras, major enduring themes, turning points, events, consequences, and people in the history of the United States and world and the implications for the present and future. c. Trace and critique the roots and evolution of *democratic ideals* and

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
		United States and the world. d. Analyze interpretations of *historical* events that are based on different perspectives and evidence.	*constitutional principles* in the history of the United States and the world using historical sources. d. Analyze and critique varying interpretations of *historic* people, issues, or events, and explain how evidence is used to support different interpretations.

E2 Individual, Cultural, International, and Global Connections in History

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students understand *historical* aspects of the uniqueness and commonality of individuals and groups, including Maine Native Americans. a. Explain how individuals, families, and communities share both common and unique aspects of culture, values, and beliefs through stories, traditions, religion, celebrations, or the arts. b. Describe traditions of Maine Native Americans and various *historical and recent immigrant groups* and traditions common to all.	**Students understand *historical* aspects of unity and diversity in the community, Maine, and the United States, including Maine Native American communities.** a. Describe examples in the history of the United States of diverse and shared values and traditions. b. Describe various cultural traditions and contributions of Maine Native Americans and various *historical and recent immigrant groups* in the community, Maine, and the United States.	**Students understand *historical* aspects of unity and diversity in Maine, the United States, and various world cultures, including Maine Native Americans.** a. Explain how both unity and diversity have had important roles in the history of Maine, the United States, and other nations. b. Identify and compare a variety of cultures through time, including comparisons of native and immigrant groups in the United States, and eastern and western societies in the world. Describe major turning points and events in the history of Maine	**Students understand *historical* aspects of unity and diversity in the United States and the world, including Native American communities.** a. Identify and critique issues characterized by unity and diversity in the history of the United States and other nations, and describe their effects. b. Identify and analyze major turning points and events in the history of Native Americans and various *historical and recent immigrant groups* in the United States, and other cultures in the world.

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
		Native Americans, various *historical and recent immigrant groups* in Maine, the United States, and other cultures in the world.	

VISUAL AND PERFORMING ARTS

The visual and performing arts are an essential part of every child's education. Engagement in the visual and performing arts deepens students' overall knowledge and skills, as well as their social and emotional development. Research shows that students involved in the visual and performing arts are more successful in school, more involved in their communities, and perform better on standardized tests.

The National Standards for Arts Education includes separate standards for dance, music, theatre, and visual arts. In 1997, the National Assessment of Educational Progress (NAEP) Arts assessment was developed with separate assessments in these disciplines. These four visual and performing arts disciplines are uniquely different from each other in literacy as well as creation and performance. Standards A and B of the Visual and Performing Arts Standards of the Maine *Learning Results* each include four separate strands (dance, music, theatre, and visual arts). In contrast, standards C, D, and E are representative of skills and knowledge in all four disciplines of the visual and performing arts. This format best represents both the unique and common aspects of the visual and performing arts. The decision about the breadth of the programming in the visual and performing arts resides with the School Administrative Units (SAU).

These Visual and Performing Arts Standards outline a comprehensive pathway to enable every high school graduate to exhibit proficiency in one or more of the visual and performing arts disciplines. The key to success is local commitment to the visual and performing arts. Staffing, scheduling, and resources vary from SAU to SAU. Research supports the implementation of a comprehensive visual and performing arts education curriculum to meet the learning needs of all students. Connecting the visual and performing arts with other content areas of the curriculum improves teaching and learning.

This document guides SAUs in developing comprehensive and sequential standards-based visual and performing arts curricula for student learning. The use of these standards may assist in the improvement of instruction generally, and impact student learning, not only in the visual and performing arts but in other content areas, as well.

OUTLINE OF VISUAL AND PERFORMING ARTS STANDARDS AND PERFORMANCE INDICATOR LABELS

A. Disciplinary Literacy

Dance:

1. **Terminology**
2. **Space**
3. **Time**
4. **Energy**
5. **Locomotor and Non-Locomotor Movement**
6. **Compositional Forms**

Music:

1. **Music Difficulty**
2. **Notation and Terminology**
3. **Listening and Describing**

Theatre:

1. **Terminology**
2. **Production**

Visual Arts:

1. **Artist's Purpose**
2. **Elements of Art and Principles of Design**
3. **Media, Tools, Techniques, and Processes**

B. Creation, Performance, and Expression

Dance:

1. **Communication**
2. **Sequencing**
3. **Solving Challenges**
4. **Technical Aspects**

Music:

1. **Style/Genre**
2. **Composition**

Theatre:

1. **Movement**
2. **Character**
3. **Improvisation**

Visual Arts:

1. **Media Skills**
2. **Composition Skills**
3. **Making Meaning**
4. **Exhibition**

C. Creative Problem-Solving

1. Application of Creative Process

D. Aesthetics and Criticism

1. Aesthetics and Criticism

E. Visual and Performing Arts Connections

1. The Arts and History and World Cultures

2. The Arts and Other Disciplines

3. Goal-Setting

4. Impact of the Arts on Lifestyle and Career

5. Interpersonal Skills

A.Disciplinary Literacy - Dance: Students show literacy in the discipline through understanding and demonstrating concepts, skills, terminology, and processes.

A1 Terminology

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify *space, time,* and *energy* concepts. a. Identify elements of space: high/low, forward/backward, near/far, and personal space, and wide/narrow and stretched/curled/twisted shape(s). b. Identify elements of *time*: steady and fast/slow beat. c. Identify elements of energy: hard/soft, light/strong, and resting/moving.	**Students identify and describe the dance concepts of *space, time, energy*, and *composition form*.** a. Identify and describe elements of *space*: straight/curved/ zig-zag/ spiral pathways, and positive/negative space. b. Identify and describe elements of *time*: steady beat and tempo changes. c. Identify and describe sustained/abrupt *energy*. d. Identify and describe patterns of *composition form*.	**Students identify and describe the dance terms of *time, composition*, and *style/tradition*.** a. Identify and describe *time*: complex meters. b. Identify and describe *composition:* phrasing. c. Identify and describe *style/tradition*: specific dances students learn from different cultures and/or their own.	**Students apply accumulated knowledge of dance composition, dynamics, and terminology to describe and perform dances with greater complexity and variation**

A2 Space

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students demonstrate *space* concepts including high/low, forward/backward, near/far, and personal space and wide/narrow, and stretched/curled/twisted shape(s).	**Students use *space* concepts to solve movement challenges including straight/curved/zig-zag/spiral pathways and positive/negative space.**	**Students apply *space* concepts in a repeatable movement phrase.**	**Students apply *space* concepts in an original repeatable, choreographed piece.**

A3 Time

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students replicate tempo change using body movement.	**Students identify and replicate a steady beat in varied tempos using body movement.**	**Students move to complex rhythm patterns and syncopation.**	**Students identify and move to rhythms of various *genres*.**

A4 Energy

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students recognize and demonstrate hard/soft, light/strong, and resting/moving movements to show differences in energy qualities.	**Students recognize and demonstrate sustained and abrupt movements to show differences in energy qualities.**	**Students explain and incorporate bound/free, tension/relaxation, indirect/direct movements to show differences in energy qualities.**	**Students incorporate energy qualities into a choreographed piece as a solo, small group, or ensemble.**

A5 Locomotor and Non-Locomotor Movement

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify and demonstrate *locomotor* and *non-locomotor/axial* skills.	**Students demonstrate expressive combinations of *locomotor* and *non-locomotor/axial* skills.**	**Students combine and demonstrate the technical skills of *skeletal alignment*, strength, agility, and**	**Students integrate and demonstrate the technical skills of *skeletal alignment, body-part isolation*,**

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
a. Identify the difference between a *locomotor and non-locomotor/axial* skill. b. Demonstrate *locomotor* patterns using change in direction, level, and pathway. c. Demonstrate *non-locomotor/axial* skills.	a. Demonstrate combinations of *locomotor* patterns, with changes in direction, level, and path. b. Demonstrate a combination of *locomotor* and *non-locomotor/ axial skills* into a pattern that may change direction, level, energy, or pathway. c. Demonstrate combinations of *non-locomotor/axial* skills.	**coordination.**	**strength, flexibility, agility, and coordination.**

A6 Compositional Forms

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students replicate, with a partner, the dance *composition forms* of copying, mirroring, leading, and following.	**Students replicate a *dance movement*.**	**Students replicate a *dance phrase*.**	**Students replicate dance *composition forms* and themes, including *narrative, canon, call and response, ab, aba, rondo, retrograde, palindrome,* and *theme and variation*.**

A.Disciplinary Literacy – Music: Students show literacy in the discipline by understanding and demonstrating concepts, skills, terminology, and processes.

A1 Music Difficulty

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students accurately perform a short musical selection, both instrumentally and vocally, while modeling proper posture and *technique,* alone or with others.	**Students accurately perform music in easy keys, *meters*, and rhythms with limited ranges, both instrumentally and vocally, while modeling proper posture and *technique*, alone or with others.**	**Students accurately perform music that includes changes of tempo, key, and *meter* in modest ranges with moderate technical demands, modeling proper posture and *technique,* alone or with others.**	**Students perform music that requires well-developed technical skills, attention to phrasing and interpretation, and the ability to perform various *meters* and rhythms in a variety of keys while modeling proper posture and *technique,* alone or with others.**

A2 Notation and Terminology

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify and read musical notation, symbols, and terminology of *dynamics*. a. Read whole and half notes in 4/4 meter signatures. b. Identify symbols and traditional terms referring to *dynamics*.	**Students identify and read musical notation, symbols, and terminology of *dynamics*.** a. Read whole, half, dotted half, quarter, and eighth notes and rests in 2/4, 3/4, and 4/4 meter signatures. b. Identify symbols and traditional terms referring to *dynamics*, tempo, and articulation.	**Students apply accumulated knowledge of musical notation, symbols, and terminology to a music performance.** a. Read whole, half, quarter, eighth, sixteenth, and dotted notes and rests in 2/4, 3/4, 4/4, 6/8, and 3/8 meter signatures. b. Read simple melodies in both the treble and bass clefs. c. Apply notation symbols for pitch, rhythm, *dynamics*, tempo, articulation, and expression.	**Students apply accumulated knowledge of musical notation, symbols, and terminology to perform music with greater complexity and variation including sudden *dynamic* contrasts.**

A3 Listening and Describing

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students listen to and identify elements of music including *meter* and simple *form* and attributes including loud/soft, fast/slow, high/low, and long/short beat and steady/strong beat.	**Students listen to and describe simple examples of the elements of music including pitch, rhythm, tempo, *dynamics, form, timbre, meter*, phrases, style, and major/minor harmony.**	**Students listen to and compare elements of music, including pitch, rhythm, tempo, *dynamics, form, timbre*, texture, harmony, style, and *compound meter*.**	**Students listen to, analyze, and evaluate music using their understanding of pitch, rhythm, tempo, *dynamics, form, timbre*, texture, harmony, style, and *compound meter*.**

A.<u>Disciplinary Literacy – Theatre:</u> Students show literacy in the art discipline by understanding and demonstrating concepts, skills, terminology, and processes.

A1 Terminology

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify the "who, what, where, when, and why" of a dramatic performance they have participated in or seen.	**Students describe theatre terms including *stage directions*, rehearsal, plot, gesture, director, motivation, conflict, improvisation, and *blocking*.**	**Students identify and explain theatre terms and concepts including *stage business*, ad-libbing, conflict, action/reaction, focus, and *stage directions*.**	**Students identify and define the *parts of the stage*, and identify and describe the crisis, resolution, and theme of the play.**

A2 Production

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students select or make props, costumes, set pieces, and/or puppets, and practice using them appropriately.	**Students select and make props, costumes, set pieces, and/or puppets, and present a rehearsed scene.**	**Students describe and participate in a performance from pre-show through *strike*.** a. Identify and explain the roles of production staff.	**Students fulfill at least one technical role from pre-show through *strike*.** a. Apply technical knowledge and skills to collaboratively and safely create

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
		b. Design and select props, costumes and stage pieces, and use them appropriately and safely. c. Build scenic elements or props to fit production design. d. Experiment with lighting, sound, and costume in scene development. e. Direct or stage-manage a scene. f. Describe basic technical needs for a theatre production, including lights, sound, props, makeup, and costumes.	and use theatre props, costumes, makeup, and stage pieces. b. Direct or stage-manage a scene or full production. c. Develop specific light and sound cues and use them in scene development. d. Participate in the audition process.

A. <u>Disciplinary Literacy - Visual Arts:</u> Students show literacy in the art discipline by understanding and demonstrating concepts, skills, terminology, and processes.

A1 Artist's Purpose

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students recognize a variety of purposes for making art, including telling a story, communicating emotion, or beautifying functional objects.	**Students explain purposes for making art in different times and places, and the relationship to cultural traditions, personal expression, and communication of beliefs.**	**Students explain and compare different purposes of artists and their artwork, in the context of time and place.**	**Students research and explain how art and artists reflect and influence culture and periods of time.**

A2 Elements of Art and Principles of Design

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify features of *composition*. a. Identify *Elements of Art*: color, form, line, shape, space, texture, and value. b. Identify *Principles of Design* including pattern and balance.	**Students describe features of *composition*.** a. Describe *Elements of Art*: color, form, line, shape, space, texture, and value. b. Describe *Principles of Design* including balance, contrast, emphasis, movement, and pattern.	**Students compare features of *composition* both within an art work and among art works.** a. Compare *Elements of Art*: color, form, line, shape, space, texture, and value. b. Compare *Principles of Design* including balance, contrast, emphasis, movement, pattern, rhythm, and unity.	**Students evaluate all the features of *composition*.** a. Evaluate *Elements of Art*: color, form, line, shape, space, texture, and value. b. Evaluate *Principles of Design* including balance, contrast, emphasis, movement, pattern, rhythm, and unity.

A3 Media, Tools, Techniques, and Processes

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students name art *media* and associated *tools*, for multiple *art forms* and *genres*.	**Students describe a variety of *media* and associated *tools, techniques*, and *processes*, for multiple *art forms* and *genres*.**	**Students explain the effects of *media* and their associated *tools, techniques*, and *processes*, using *elements*, *principles* and expressive qualities in *art forms* and *genres*.**	**Students compare the effects of *media* and their associated *tools, techniques,* and *processes*, using *elements*, *principles,* and expressive qualities in *art forms* and *genres*.**

B.Creation, Performance, and Expression – Dance: Students create, perform, and express ideas through the art discipline.

B1 Communication

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
No performance indicator. Although no performance indicators are stated students are expected to have instructional experiences that help them to express themselves through movement.	**Students use movement to express a basic idea and share it with their peers.**	**Students use movement to express and communicate a story, a piece of music, an artwork, or an emotion.**	**Students create an original piece of choreography using the elements of dance.** a. Improvise new movements. b. Manipulate learned movements.

B2 Sequencing

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students develop a short dance sequence with a beginning, middle, and end.	**Students develop a *dance phrase* with a beginning, middle, and end, accurately repeating and varying it.**	**Students create and develop dance sequences.** a. Create and develop dance sequences based on personal ideas or *concepts* from other sources. b. Reproduce a more complex or pre-existing choreographed movement sequence as a solo or in a small group.	**Students create both solo and ensemble dance works accurately producing an original or pre-existing complex movement sequence with *rhythmic acuity*.**

B3 Solving Challenges

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students solve a variety of *movement challenges* alone or in a group.	Students solve *movement challenges* involving one or more movement *concepts* alone or with a partner.	Students use improvisation to discover and invent movement sequences and solve *movement challenges* with one or more partners.	Students solve increasingly complex *movement challenges* involving several dance concepts with one or more partners.

B4 Technical Aspects

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify possible props or costumes to enhance a short *dance phrase*.	Students select props or costumes to enhance a *dance phrase* and explain the choice.	Students identify and select light, costume, or sound changes to enhance a *dance phrase*.	Students include and explain costume, light, and sound changes in a piece of choreography.

B.Creation, Performance, and Expression – Music: Students create, perform, and express through the art discipline.

B1 Style/Genre

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students create or perform short musical selections of various styles and *genres* accurately applying selected knowledge and skills of: proper posture and *technique;* notation; symbols; and terminology of *dynamics*.	Students create or perform music of various styles and *genres* in easy keys, *meters*, and rhythms with limited ranges accurately applying the knowledge and skills of: proper posture and *technique*; notation; symbols; and terminology of *dynamics.*	Students perform music of various styles and *genres* that includes changes of tempo, key, and *meter* in modest ranges with moderate technical demands accurately applying the accumulated knowledge and skills of: proper posture and *technique;* musical notation; symbols; and terminology.	Students perform music of various styles and *genres* that requires well-developed technical skills, attention to phrasing and interpretation and various *meters* and rhythms in a variety of keys, accurately applying the accumulated knowledge and skills of: proper posture and *technique;* musical notation; symbols; and terminology.

B2 Composition

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students use knowledge and skills of standard and non-standard *notation*, symbols, and terminology of *dynamics*.	**Students create their own *compositions* by applying the knowledge and skills of notation, symbols, and terminology of *dynamics*.**	**Students compare musical ideas expressed in their own *compositions* or the *compositions* of others.**	**Students analyze and evaluate musical ideas expressed in their own *compositions* or the *compositions* of others.**

B.Creation, Performance, and Expression - Theatre: Students create, perform, and express through the art discipline.

B1 Movement

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students participate in skits, puppet shows, theatre games, and/or show and tell using movement skills.	**Students demonstrate *blocking* in a play by carrying out their assigned stage movements.**	**Students apply gesture, movement, and *stage business* in the portrayal of a role.**	**Students refine gesture and *stage business* in the portrayal of a role.**

B2 Character

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students demonstrate a character by participating in skits, puppet shows, and/or theatre games.	**Students demonstrate the ideas, moods, and/or feelings of a character and demonstrate proper posture and breathing techniques to project voice through the use of script and improvisation based on stories.**	**Students demonstrate development of a character's attitude and point of view by adjusting voice timing and tone/level and using *non-verbal techniques.***	**Students demonstrate development of a character's attitude and point of view using voice timing, voice tone/level, and *physicality* to communicate ideas, moods, intentions, and/or feelings.**

B3 Improvisation

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students improvise through theatre games by using plot, setting, and characters.	**Students improvise through theatre games by using voice, motivation, and *body part isolations*.**	**Students improvise through theatre games by using *blocking*, relationships, props, and movement.**	**Students improvise through theatre games or productions to address unforeseen circumstances.**

B.Creation, Performance, and Expression - Visual Arts: Students create, express, and communicate through the art discipline.

B1 Media Skills

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students use basic *media, tools* and *techniques* to create original art works.	**Students use a variety of *media, tools, techniques*, and *processes* to create original art works.**	**Students choose suitable *media, tools, techniques,* and *processes* to create original art works.**	**Students choose multiple suitable *media, tools, techniques*, and *processes* to create a variety of original art works.**

B2 Composition Skills

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students use *Elements Of Art* and *Principles Of Design* to create original art works.	**Students use *Elements of Art* and *Principles of Design* to create original art works including paintings, three-dimensional objects, drawings from imagination and real life, and a variety of other *media* and visual *art forms*.**	**Students use *Elements of Art* and *Principles of Design* to create original art works that demonstrate different *styles* in paintings, three-dimensional objects, drawings from imagination and real life, and a variety of other *media* and visual *art forms*.**	**Students use *Elements of Art* and *Principles of Design* to create original art works that demonstrate development of personal style in a variety of *media* and visual *art forms*.**

B3 Making Meaning

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students create art works that communicate ideas and feelings and demonstrate skill in the use of *media, tools, and techniques.*	**Students create art works that communicate ideas, feelings, and meanings and demonstrate skill in the use of *media, tools, techniques,* and *processes.***	**Students create art works that communicate an individual point of view.** a. Demonstrate skills in the use of *media, tools, techniques*, and *processes*. b. Demonstrate knowledge of visual art concepts. c. Communicate a variety of ideas, feelings, and meanings.	**Students create a body of original art work.** a. Demonstrate sophisticated use of *media, tools, techniques*, and *processes*. b. Demonstrate knowledge of visual art concepts. c. Communicate a variety of ideas, feelings, and meanings.

B4 Exhibition

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
No performance indicator. Although no performance indicators are stated, students may participate in the preparation of art for display and all students are expected to have instructional experiences that help them to understand how art is prepared for display and why different choices related to preparation may be made.	**Students help with the selection and preparation of art works for display in the classroom, school, or other community location.**	**Students select and prepare art works for display in the classroom, school, or other community location, and articulate an artistic justification for their selection.**	**Students select, prepare, and help with exhibiting their works in the classroom, school, or other community location, and articulate an artistic justification for their selection.**

C.Creative Problem Solving: Students approach artistic problem-solving using multiple solutions and the creative process.

C1 Application of Creative Process

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify and demonstrate *creative problem-solving* skills. a. Improvise to solve problems in the performing arts. b. Imagine and share possible solutions to apply to challenges in creating art.	**Students describe and apply steps of *creative problem-solving*.** a. Identify problem. b. Define problem. c. Generate a variety of solutions. d. Implement solution(s). e. Evaluate solution(s).	**Students describe and apply creative-thinking skills that are part of the *creative problem-solving* process.** a. *Fluency* b. *Flexibility* c. *Elaboration* d. *Originality* e. *Analysis*	**Students apply and analyze *creative problem-solving* and creative-thinking skills to improve or vary their own work and/or the work of others.**

D. Aesthetics and Criticism: Students describe analyze, interpret, and evaluate art (dance, music, theatre, and visual arts).

D1 Aesthetics and Criticism

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students observe, listen to, describe and ask questions about *art forms*. a. Describe the *art form* by applying grade span appropriate arts *concepts*, terminology, skills, and processes as referenced in Standard A: Disciplinary Literacy.	**Students describe and compare *art forms*.** a. Describe and compare *art forms* by applying grade span appropriate arts *concepts*, terminology, skills, and processes as referenced in Standard A: Disciplinary Literacy. b. Ask questions about an *art form* to	**Students compare and analyze *art forms*.** a. Compare and analyze *art forms* by applying grade span appropriate *concepts*, vocabulary, skills, and processes as referenced in Standard A: Disciplinary Literacy.	**Students analyze and evaluate *art forms*.** a. Describe, analyze, interpret, and evaluate *art forms* by applying grade span appropriate arts *concepts*, vocabulary, skills, and processes as referenced in Standard A: Disciplinary Literacy.

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
b. Ask questions about the *art form* to further understand how the *artist* created/performed the work of art. c. Recognize a variety of purposes for making/performing art works, including telling a story and communicating emotions and ideas.	further understand the concepts, skills, and processes used to create/perform the work of art. c. Explain purposes for making art in different times and places, including cultural traditions, personal expression, and communication of beliefs.	b. Compare the quality and effectiveness of art works using multiple criteria from observations, *print and/or non-print resources*. c. Compare the effectiveness of selected media, techniques, and processes in communicating ideas. d. Explain and compare different purposes of artists and art work in the context of time and place.	b. Analyze and evaluate varied interpretations of works of art using evidence from observations and a variety of *print and/or non-print sources*. c. Demonstrate an understanding of the difference between a personal opinion and an informed judgment. d. Research and explain how art and artists reflect and shape their time and culture.

E. Visual and Performing Arts Connections: Students understand the relationship among the arts, history and world culture; and they make connections among the arts and to other disciplines, to goal-setting, and to interpersonal interaction.

E1 The Arts and History and World Cultures

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify family or community symbols and celebrations in the visual/performing arts from different world cultures.	**Students explain that the visual/performing arts help people understand history and/or world cultures.**	**Students compare products of the visual/performing arts to understand history and/or world cultures.**	**Students analyze the characteristics and purposes of products of the visual/performing arts to understand history and/or world cultures.**

E2 The Arts and Other Disciplines

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify connections between and among the arts and other disciplines.	**Students describe characteristics shared between and among the arts and other disciplines.**	**Students explain skills and concepts that are similar across disciplines.**	**Students analyze skills and concepts that are similar across disciplines.**

E3 Goal-Setting

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify choices that lead to success in the arts.	**Students identify and demonstrate choices that will lead to success in the arts including *time management*, interpersonal interactions, skill development, and goal-setting.**	**Students set goals related to *time management*, interpersonal interactions, or skill development that will lead to success in the arts.**	**Students make short-term and long-term goals based on rigorous criteria and related to *time management*, interpersonal interactions, or skill development that will lead to success in the arts.**

E4 Impact of the Arts on Lifestyle and Career

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify the arts in life experiences. a. Identify the activities and careers of a visual or performing *artist.* b. Describe *common arts activities*. c. Describe the way the arts can make people feel.	**Students describe the contribution of the arts on lifestyle and career choices.** a. Identify the various roles of, and requirements to become, *artists*. b. Describe the benefit of participation in the arts on a healthy lifestyle including the use of leisure time.	**Students explain the impact of artistic and career choices on self, others, and the natural and *man-made environment.***	**Students explain how their knowledge of the arts relates to *school-to-school* and *school-to-work* transitions and other career and life decisions including the recognition that the arts are a means of renewal and recreation.**

E5 Interpersonal Skills

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify positive interpersonal skills that impact the quality of their art and participation in the arts.	**Students identify and demonstrate the positive interpersonal skills necessary to get along with others and participate in the arts.**	**Students demonstrate positive interpersonal skills and analyze how interpersonal skills affect participation in the arts.**	**Students demonstrate positive interpersonal skills and reflect on the impact of interpersonal skills on personal success in the arts.**

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
a. Getting along with others b. Respecting differences c. Working as a team/ensemble d. Managing conflict e. Accepting/giving/using constructive feedback f. Accepting responsibility for personal behavior g. Demonstrating ethical behavior h. Following established rules/etiquette for observing/listening to art i. Demonstrating safe behavior	a. Getting along with others b. Respecting differences c. Working as a team/ensemble d. Managing conflict e. Accepting/giving/using constructive feedback f. Accepting responsibility for personal behavior g. Demonstrating ethical behavior h. Following established rules/etiquette for observing/listening to art i. Demonstrating safe behavior	a. Getting along with others b. Respecting differences c. Working as a team/ensemble d. Managing conflict e. Accepting/giving/using constructive feedback f. Accepting responsibility for personal behavior g. Demonstrating ethical behavior h. Following established rules/etiquette for observing/listening to art i. Demonstrating safe behavior	a. Getting along with others b. Respecting differences c. Working as a team/ensemble d. Managing conflict e. Accepting/giving/using constructive feedback f. Accepting responsibility for personal behavior. g. Demonstrating ethical behavior h. Following established rules/etiquette for observing/listening to art i. Demonstrating safe behavior

WORLD LANGUAGES

Language and communication are at the heart of the human experience whether communication occurs face-to-face, in writing, or through the arts and media. Graduates of Maine's publicly supported schools must have the linguistic and cultural skills to communicate successfully in a pluralistic society at home and abroad. The need to understand and communicate with other peoples of the world is more urgent today because of the forces of globalization. All students are expected to develop the level of proficiency defined in the standards and performance indicators at the 9-Diploma grade span in at least one language other than English. To succeed, all students must study language and culture in an integrated fashion beginning in the early elementary grades and extending through their school experience. A PreK-Diploma structure in all schools is foundational to the State vision for world languages.

The major organizing principle in today's world language classrooms is communication. While knowledge of vocabulary and the linguistic system remain essential tools for communication, learning to use a second language in meaningful and appropriate ways is the ultimate goal of world language instruction. In any mode of communication, there are particular links between language usage and knowledge of the associated culture(s). In the study of classical languages such as Latin or ancient Greek, proficiency will emphasize the ability to understand the written language over oral communication and will recognize the linguistic and historical importance of the language and the people who spoke it.

Differentiation and Commonality Among World Languages – The World Languages Standards outline both common and unique descriptors for modern and classical languages. Distinctions between modern and classical languages are identified only where necessary to acknowledge significant differences in communication modes and resources. References in the performance indicators and descriptors of modern languages are inclusive of American Sign Language (ASL) except where otherwise noted.

Multiple Entry Points - Throughout the World Languages Standards, the sequence of performance indicators is based on a PreK-Diploma course of study of mainly cognate languages (languages that contain words from two languages that are similar in spelling and meaning or sound and meaning). Some students may elect to participate in the study of more than one world language. In these instances, it is important to recognize that the PreK-Diploma grade span represents a continuum of learning. Students who begin a language later in the Pre-K-Diploma sequence of study and students who study a non-cognate language may not be able to reach the highest level performance indicators (9-Diploma) without additional language experiences – instructional or immersion – or a heritage language background. Students beginning additional world languages at grade 9 or above should not be held accountable for performance indicators at this level. Rather, curriculum, instruction, and assessment will need to be aligned to the grade span expectations that reflect the students' level of proficiency and advance from that point to the standards and performance indicators defined in subsequent grade spans.

Instruction and Support in the Target Language - All performance indicators for modern languages, with the exception of one (A4), are to be accomplished in the target language (the non-English language being studied by the student). Students engaged in a sequential PreK-Diploma modern language program are expected to develop the knowledge and skills necessary to communicate basic understandings for all performance indicators using target language at a level appropriate to the grade span. Proficiency in the study of classical languages, such as Latin or ancient Greek, emphasizes the ability to understand written language over oral communication although oral communication remains a component. Accordingly, performance indicators A2, A4, B1, B2, B3, C1, C2, and D1 may be accomplished in the target language or English.

Level of Discourse – Standard A outlines grade span proficiencies at grades PreK-2, 3-5, 6-8, and 9-Diploma for communication skills. The document assumes that as students learn the knowledge and skills outlined in Standards B, C, and D, they will do so by developing and using communication skills learned in Standard A, as appropriate to their grade span. By the end of the grade span, students should be able to demonstrate their proficiency of the standards and performance indicators related to Standards B, C, and D using communication skills learned in Standard A, as appropriate for the end of that grade span.

OUTLINE OF WORLD LANGUAGES STANDARDS AND PERFORMANCE INDICATOR LABELS

A. Communication
1. Interpersonal
2. Interpretive
3. Presentational
4. Language Comparisons
B. Cultures
1. Practices and Perspectives
2. Products and Perspectives
3. Comparisons with Own Culture
C. Connections
1. Knowledge of Other *Learning Results* Content Areas
2. Distinctive Viewpoints
D. Communities
1. Communities

A.<u>Communication</u>: Students communicate in the target language.

A1 Interpersonal

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students engage in simple interactions to provide and obtain information using single words or learned phrases. <u>Modern and Classical</u> a. Use *culturally-appropriate* and age-appropriate *courtesy expressions*. b. Participate in brief *guided exchanges* related to likes and dislikes. c. Make age-appropriate introductions of classmates, family members, and friends. d. Ask and answer simple learned questions.	**Students engage in simple conversations to provide and obtain information using learned phrases and simple sentences.** <u>Modern and Classical</u> a. Recognize and use *appropriate forms of address* and *courtesy expressions* in a variety of situations. b. Ask and answer simple questions regarding familiar activities. c. Give and respond to simple oral/signed directions and commands and make routine requests in the classroom. <u>Modern only</u> d. Participate in brief guided conversations related to needs, interests, likes, dislikes, and *states of being*. e. Express basic agreement and disagreement.	**Students engage in simple conversations to provide and obtain information and to express feelings and emotions by creating simple sentences and/or strings of sentences. Students of modern languages use pronunciation and *intonation* patterns or use appropriate *non-manual markers* (ASL), which are comprehensible to speakers accustomed to interacting with language learners.** <u>Modern and Classical</u> a. Ask and answer a variety of questions on familiar topics, orally or in sign language, and in writing. <u>Modern only</u> b. Participate in conversations on a variety of everyday topics to meet personal needs. c. Give and respond to directions and commands, orally or in sign language, and in writing. <u>Classical only</u> d. Exchange information in writing	**Students express their own thoughts and opinions about familiar topics and elicit the thoughts and opinions of others by using strings of sentences and/or short paragraphs. Students of modern languages use pronunciation and *intonation* patterns or use appropriate *non-manual markers* (ASL), which would be comprehensible to a *native speaker* accustomed to interacting with language learners.** <u>Modern only</u> a. Interact in a variety of social situations including formal and informal personal exchanges and/or phone inquiries. b. Provide and exchange detailed information on familiar topics, orally or in sign language, and in writing. c. Describe and explain *states of being*, orally or in sign language, and in writing. d. Express agreement and disagreement, orally or in sign

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
		about familiar topics.	language, and in writing, supporting opinions with simple reasoning. Classical only e. Exchange information in writing on identified topics.

A2 Interpretive
For classical languages only, the 6-8 and 9-Diploma indicators may be accomplished in the target language or English.

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students comprehend and respond to simple spoken/signed language in a classroom setting. Modern and Classical a. Respond to simple oral/signed directions, commands, and routine requests in the classroom. b. Identify people and objects based on oral/signed descriptions.	**Students comprehend and respond to simple spoken/signed and written language in *familiar contexts*.** Modern only a. Comprehend isolated words, phrases, and simple sentences in familiar print materials. b. Respond to simple written directions. c. Respond to oral/signed directions, commands, and routine requests. d. Identify people and objects based on oral/signed and written descriptions.	**Students comprehend brief conversations, *narratives*, and recorded material in *familiar contexts*.** Modern only a. Identify main ideas, topics, and details from simple oral/signed and written texts. Classical only b. Identify main ideas, topics, and details from simple written texts.	**Students comprehend conversations, *narratives*, and recorded material in *familiar contexts* that are longer and/or more complex than those in the 6-8 grade span.** Modern and Classical a. Identify main ideas, topics, and specific information in a variety of *authentic* written/signed *materials*. Modern only b. Identify main ideas, topics, and specific information in *authentic* films. c. Identify main ideas, topics, and specific information in a variety of

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
	Classical only e. Identify people and objects based on written descriptions. f. Demonstrate comprehension of simple texts by identifying people and objects.		*authentic* oral/signed *materials*. Classical only d. Interpret the author's use of *literary devices* evident in prose and poetry.

A3 Presentational

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students use memorized words or phrases and visuals in short oral/signed presentations. Modern and Classical a. Provide simple descriptions of people, places, and objects.	**Students use phrases and simple sentences in rehearsed oral /signed and written presentations on familiar topics.** Modern and Classical a. Write/sign familiar words and phrases, and short messages, descriptions, or simple poems. Modern only b. Provide simple oral/signed and written descriptions of people, places, and objects. c. Present simple short plays/skits and/or simple short written texts. Classical only d. Read aloud from an *adapted text*.	**Students use simple sentences and strings of simple sentences to produce short oral/signed and written presentations based on familiar topics and including a level of accuracy in form and pronunciation that could be understood by speakers accustomed to interacting with language learners.** Modern only a. Write/sign messages using a prescribed, *culturally-appropriate* format. b. Produce and present simple creative works orally or in sign language, and in writing. c. Convey personal preferences or information pertaining to everyday	**Students express their own thoughts to describe and narrate in oral/signed and written presentations using strings of sentences and/or short paragraphs and with sufficient accuracy in form and pronunciation that could be understood by *native speakers* accustomed to interacting with language learners.** Modern and Classical a. Read *authentic passages* aloud with appropriate pronunciation, phrasing, and *intonation*. Modern only b. Relate a story about a personal experience or event orally or in sign language. c. Paraphrase and/or summarize texts

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
		life orally or in sign language, and in writing. <u>Classical only</u> d. Create written products based on a given topic. e. Read aloud from *adapted texts* with appropriate *intonation* and pronunciation.	orally or in sign language, and in writing using a *presentational format*. d. Write/sign brief narrative compositions and expository/informational compositions. e. Give oral/signed presentations on familiar subjects related to a culture(s) in which the *target language* is spoken. <u>Classical only</u> f. Paraphrase and/or summarize texts orally or in writing in a *presentational format* using the *target language* or English.

A4 Language Comparisons
For both modern and classical languages, indicators may be accomplished in the target language or English.

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
No performance indicator. Although no performance indicators are stated, students are expected to have instructional experiences related to similarities and differences between the target language and English.	**Students recognize a variety of similarities and differences between the *target language* and English.** <u>Modern and Classical</u> a. Recognize *word borrowings* and *cognates* among languages.	**Students compare the *target language* with English in order to better understand *language systems*.** <u>Modern and Classical</u> a. Compare basic grammatical structures and *syntax* between	**Students use their understanding of the *nature of language* to enhance their communication in the *target language*.** <u>Modern and Classical</u> a. Compare a variety of grammatical structures and *syntax* between

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
	b. Recognize differences in the *writing systems* among languages.* c. Recognize some *idiomatic expressions* of the *target language*.	languages. b. Compare *idiomatic expressions* between languages. c. Compare pronunciation systems between languages. ***** d. Recognize that there are regional and/or historical variations in spoken/signed language. e. Explain connections between languages through the identification of *cognates*.	languages. b. Identify examples of vocabulary, in both languages, that do not translate directly from one language to another. c. Use *idiomatic expressions* and/or proverbs in the *target language*. d. Identify examples of vocabulary (in English and the *target language)* that convey different meanings in different *contexts*.

* **These descriptors are not appropriate for instruction in ASL.**

B.Cultures: Students demonstrate an understanding of a culture(s) in which the target language is spoken.

B1 Practices and Perspectives
For classical languages only, indicators may be accomplished in the target language or English.

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify and imitate basic *culturally-appropriate practices* of a culture(s) in which the *target language* is spoken. Modern and Classical a. Use *culturally-appropriate courtesy expressions* and demonstrate	**Students identify and demonstrate basic *culturally-appropriate practices* of daily life within a culture(s) in which the *target language* is spoken.** Modern and Classical a. Use *culturally-appropriate* polite	**Students describe *practices of a culture(s)* and *perspectives of a culture(s)* in which the *target language* is spoken.** Modern and Classical a. Describe examples of common beliefs of a culture(s) in which the	**Students identify and explain how *perspectives of a culture(s)* are related to cultural *practices of a culture(s)* in which the *target language* is spoken.** Modern and Classical a. Identify and explain the reason

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
greeting and leave-taking. b. Recognize cultural differences including dress, mealtime practices, gestures, and/or celebrations.	requests and *courtesy expressions*, and demonstrate greeting and leave-taking behaviors in a variety of age-appropriate social situations. b. Recognize age-appropriate similarities and differences related to *practices of a culture(s)* in which the *target language* is spoken.	*target language* is spoken. b. Describe common attitudes of a culture(s) in which the *target language* is spoken. c. Describe common similarities and differences related to *practices of a culture(s)* in which the *target language* is spoken.	behind significant *practices of a culture(s)* in which the *target language* is spoken. b. Describe stereotypes associated with *perspectives of a culture(s)* in which the *target language* is spoken. c. Identify differences in *cultural practices* among peoples that speak the same language.

B2 Products and Perspectives
For classical languages only, indicators may be accomplished in the target language or English.

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
No performance indicator. Although no performance indicators are stated, students are expected to have instructional experiences related to *products of a culture(s)* in which the *target language* is spoken.	**Students identify common *products of a culture(s)* in which the *target language* is spoken.**	**Students identify and explain the significance of objects used in daily life, works of art, or historical artifacts that reflect the *perspectives of a culture(s)* in which the *target language* is spoken.**	**Students explain how political structures, historical artifacts, literature, and/or visual and performing arts reflect the *perspectives of a culture(s)* in which the *target language* is spoken.**

B3 Comparisons with Own Culture
For classical languages only, indicators may be accomplished in the target language or English.

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
No performance indicator.	**Students compare some common *culturally-appropriate products and***	**Students recognize and compare *perspectives* related to *products***	**Students explain how *products, practices, and perspectives* of a**

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Although no performance indicators are stated, students are expected to have instructional experiences related to comparison of the *target culture* with the culture in which the student lives.	***practices*** **of daily life of a culture(s) in which the** ***target language*** **is spoken to the culture in which the student lives.** Modern and Classical a. Compare daily activities of their own lives to those of individuals in a culture(s) in which the *target language* is spoken. b. Compare foods, celebrations, dress, and/or dwellings of a culture(s) in which the *target language* is spoken with those of the culture in which the student lives.	***and practices*** **of a culture(s) in which the** ***target language*** **is spoken to the cultural perspectives of the culture in which the student lives.** Modern and Classical a. Compare verbal and non-verbal communication in a culture(s) in which the *target language* is spoken to communication in the culture in which the student lives. b. Recognize contributions of a culture(s) in which the *target language* is spoken to life in the United States including foods, celebrations, dress, and/or architecture.	**culture(s) in which the** ***target language*** **is spoken contribute to the culture in which the student lives.** Modern and Classical a. Identify and compare influential figures from the two cultures. b. Explain the reasons for a variety of similarities and differences between the culture in which the student lives and the culture(s) in which the *target language* is spoken. Modern only c. Use the *target language* in a manner that would be considered appropriate by *native speakers* and explain what makes it appropriate communication.

C.<u>Connections:</u> Students expand their knowledge by connecting their study of a world language(s) with other content areas.

C1 Knowledge of Other *Learning Results* Content Areas
For classical languages only, indicators may be accomplished in the target language or English.

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students identify basic language connections to other *Learning Results* content areas. <u>Modern and Classical</u> a. Identify ways of counting. b. Identify common ways of greeting people.	**Students identify connections between other *Learning Results* content areas and *the target language* and associated culture(s).** <u>Modern and Classical</u> a. Identify common expressions and traditions. b. Identify examples of the visual/performing arts. c. Identify products important to the livelihood of the people. d. Identify the earth's major geographical features.	**Students apply information acquired in other *Learning Results* content areas to further their knowledge and skills in the *target language*.** <u>Modern and Classical</u> a. Use the *writing process* learned in English Language Arts when writing for the *target language* class. * b. Apply research skills to further knowledge in the *target language*. c. Apply knowledge from other *Learning Results* content areas including literature, social studies, science and technology, and/or the visual and performing arts to tasks in the world language classroom.	**Students use the *target language* to enhance their knowledge of other *Learning Results* content areas.** <u>Modern and Classical</u> a. Provide examples of grammatical knowledge acquired in the *target language* that are used to achieve a better understanding of grammatical structures in English. b. Provide examples of information gathered through *target language* resources that are applied in other *Learning Results* content areas.

*** These descriptors are not appropriate for instruction in ASL.**

C2 Distinctive Viewpoints
For classical languages only, indicators may be accomplished in the target language or English.

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
No performance indicator. Although no performance indicators are stated, students are expected to have instructional experiences related to a variety of print and non-print materials created in a language other than English.	**Students recognize some distinctive viewpoints available only through sources from the *target language.*** Modern and Classical a. Identify examples of simple *narrative* selections from a culture(s) in which the *target language* is spoken. Classical only b. Identify information about the Roman/Greek world by reading passages with culturally *authentic settings.*	**Students locate *authentic* resources, available only through sources in the target language, and identify ideas about a culture(s) in which the *target language* is spoken.** Modern and Classical a. Locate media or other *authentic sources* from the *target language* and a culture(s) in which the *target language* is spoken and identify a *perspective and/or practice of a culture(s)* different from the students' own viewpoints and/or behaviors.	**Students locate *authentic* resources and describe ideas about the *target language* and associated culture(s) that are available only through sources in the *target language*.** Modern and Classical a. Interpret short prose, poetry, or plays in the *target language* that reflect the culture(s) in which the *target language* is spoken and make connections to the viewpoints of the culture associated with the target language(s). b. Locate selected magazines, newspapers, *authentic entertainment media* and electronic media in the *target language* and use these media as the basis for describing the viewpoints of the culture associated with the target language(s). c. Locate selected magazines, newspapers, *authentic entertainment media* and electronic media in the *target*

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
			language and describe viewpoints of a culture(s) in which the *target language* is spoken.

D. <u>Communities:</u> Students encounter and use the target language both in and beyond the classroom for personal enjoyment and lifelong learning.

D1 Communities
For classical languages only, performance indicators may be accomplished in the target language or in English.

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
Students include family, friends, or peers in activities using the *target language*.	**Students demonstrate understanding and use of the *target language* and their knowledge of a culture(s) in which the *language* is spoken through community involvement.** <u>Modern and Classical</u> a. Demonstrate use of oral/signed and/or written forms of the *target language* with family, friends, or peers. b. Participate in activities using the *target language* which can benefit the school or broader community. c. Ask questions and share knowledge about aspects of a culture(s) in which the *target language* is	**Students demonstrate an understanding and use their knowledge of the *target language* to communicate with *target language* speakers, obtain information on familiar topics, and gain understanding of another culture(s).** <u>Modern and Classical</u> a. Participate in and summarize school/community events related to the *target language* or associated culture(s). b. Identify community and online resources that can be used to gain information about the *target language* or associated culture(s).	**Students demonstrate an understanding and use their knowledge of the *target language* to communicate with *target language* speakers and to understand the importance of culture and language in the 21st century.** <u>Modern and Classical</u> a. Interact with people, either in the community or online, who use the *target language* in their professions b. Independently access a variety of *target language* sources for one's own entertainment or enrichment. c. Explain how personal, educational, and career opportunities are

Performance Indicators & Descriptors			
Pre-K-2	**3-5**	**6-8**	**9-Diploma**
	spoken to demonstrate an interest in the *target language* and an associated culture(s). d. Access online resources or resources available in the community to understand aspects of a culture(s) in which the *target language* is spoken.	c. Communicate with students in the *target language*. d. Describe language skills and cultural insights gained through real or *virtual travel*.	expanded and enhanced by knowledge of the *target language* and associated culture(s). Modern only d. Communicate with *target language* speakers using the *target language*.